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Occupational Health in Ontario

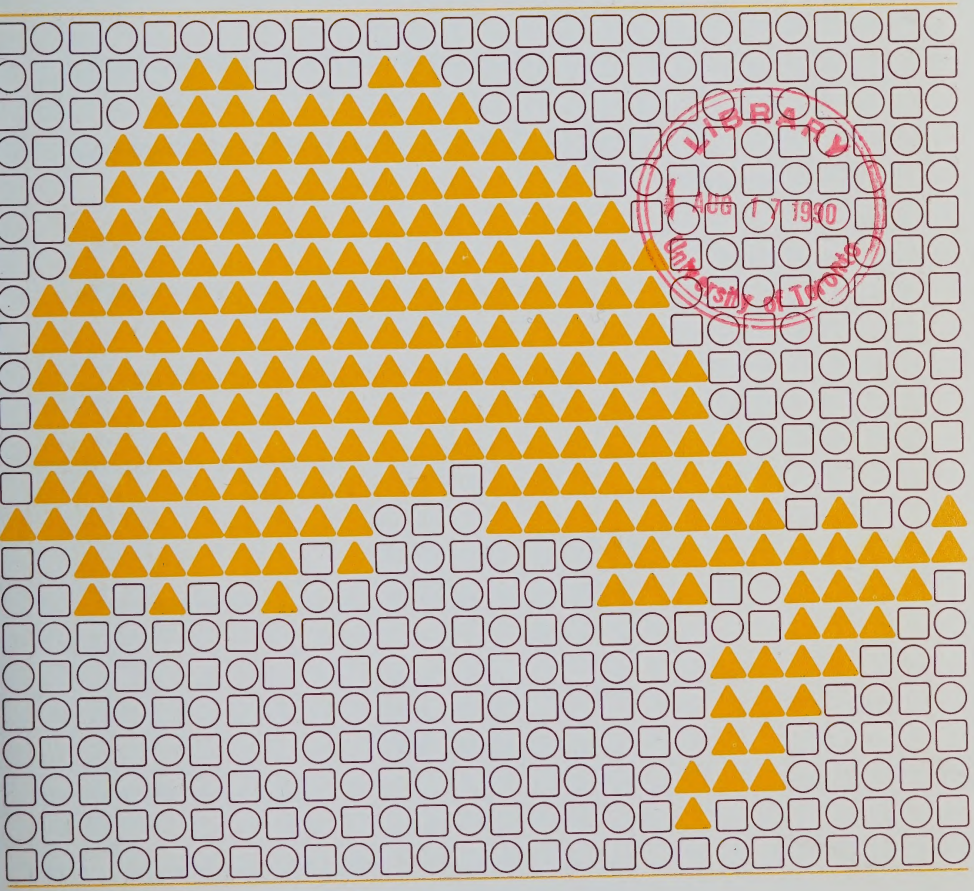
Volume 8, Number 3, Summer 1987

Studies in Assessment of Risk and Management of Environmental Contamination

Exposure Standards for CO, Methylene Dianiline, Anaesthetic Gases and PCBs

Smoking Survey of Ministry of Labour Employees

A Guide to the Revised Canada Labour Code, Part IV



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Occupational Health in Ontario

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Studies in Assessment of Risk and Management of Environmental Contamination*

Summary

This paper was presented at the 19th Annual Symposium of the Society of Toxicology of Canada. In it, the authors present some of the issues that arise during the response to episodes of environmental contamination and the response of the Ministry of Health to local agencies. Some case studies are discussed.

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Passive exposure from environmental sources has become an area of overwhelming fear and concern for the public in the last decade. This fear and concern has frequently led to panic and social unrest, resulting in solutions that are based on a perception of an exaggerated estimate of risk. Considerable human and financial resources have been assigned to respond to these situations. These reactions may urge health studies that have to satisfy the public's demands and not necessarily regard scientific rigour. Whether it is an accidental spill or fire, the purposeful use of a dangerous chemical such as a pesticide, or the installation of a facility with the potential for an accidental emission, concerns of the public have been articulated by these questions:

- have we suffered acute damage?;
- will we suffer chronic damage (chronic illness or cancer)?;
- will our children be affected?;
- who is to blame?;
- will it happen again?; and
- will we be compensated?

The community concerns that are not overtly expressed, but which may play a strong role in events, are economic: property values and compensation; political: trust in authorities; and social: stress, uncertainty and disruption of routine daily life. Concern for health is the medium through which political, economic and social interests are expressed. Scientific evaluation of health effects requires an especially creative approach in the face of the atmosphere of crisis created by the influences of the media. The public demands an answer regarding cause-effect relationships, but the tools available to evaluate these are rough and do not reflect the truly complex interactions that operate in real life.

*Presented at the 19th Annual Symposium of the Society of Toxicology in Montreal, Quebec, December 2 to 3, 1986.

Assessing the potential danger to a community from a spill, industrial emission (a fire, for example), soil or water contamination presents a unique opportunity to exercise the skills of the mediator, scientist, communicator, social psychologist and manager. An outcome that meets the expectations of the scientists, the government and the community have often been difficult to achieve. A number of essential ingredients appear to be necessary to meet these needs and to achieve an acceptable outcome. These are:

- designation of credible local authorities easily accessible to the public;
- maintain steady flow of information, even if it means admitting the temporary absence of data;
- obtain expert advice on potential toxicity and have accepted experts available to the community;
- describe positive and scientifically sound plans to assess potential dangers to health; and
- keep the media informed.

The reaction of the Ontario Ministry of Health to these issues has been to assist local agencies as much as possible in establishing a local response, to provide consulting services in epidemiology and toxicology, to provide funding for outside experts and to carry out studies where they are indicated. The concerns of government health agencies are basically no different from those of the public, but the questions and investigations tend to be directed differently. For example, epidemiologic methods dictate that biologically coherent health effects as well as meaningful exposure be identified. Thus, an unusual occurrence of disease or adverse health outcome triggers a search for a cause. Conversely, the identification of an unusual exposure triggers a search for a possible outcome. On the other hand, the public assumes meaningful exposure and direct relationships between perceived or measured effects that may or may not be expected to result from the suspected and, often, not measured, exposures. We have previously reported some of these episodes where we make use of readily available population-based information systems that measure adverse outcomes such as cancer and reproductive events to respond to concerns of residents. These systems allow examination of health effects (cancer mortality, cancer incidence and reproductive outcomes) in relation to potential environmental exposures in the population. To illustrate the general approaches in response, some examples will be presented: a PCB spill

(Kenora, 1985), continuous low-level water contamination in Niagara County, and intermittent water contamination due to industrial spills into the St. Clair River (Kent and Lambton Counties).

PCB Spill: Kenora

In the spring of 1985 a series of spills caused by an improperly transported leaky transformer containing oil that was largely PCBs was identified along the Trans-Canada Highway between Ignace and Kenora. The spills occurred largely along unpopulated stretches of highway, but some did occur in populated areas. Some commercial and private vehicles had travelled behind the leaking truck, potentially exposing a number of individuals.

The Response

Of the local agencies first contacted, the local Medical Officer of Health became the lead spokesperson regarding health issues and was supported in this role by provincial resources in epidemiology and toxicology. The health unit was responsible for the initial assessment of exposure and health effects. Other agencies, primarily the Ministry of the Environment and the Ministry of Labour, were involved in the identification of the material, its dispersion in the environment, including the possible contamination of the food chain, and the subsequent clean-up. Close liaison was maintained with all participating agencies.

The community's questions regarding exposure, acute and chronic toxicity, and potential fetal damage in the case of a potentially exposed pregnant woman were easily addressed by the quick identification of the material and the early designation of a credible spokesperson. Medical practitioners in the area were given information on evaluation of health effects due to exposure and a guideline for uniform medical assessment. Periodic, timely announcements giving updated information were made over the radio. The questions of whether it could happen again, who was to blame, was there an adequate response by government and would there be compensation, were considered later in the course of the emergency. The public's primary concern was personal health, not the damage to the environment.

The health surveillance carried out by the health unit included assessment of potential exposure, taking into consideration both direct and indirect contact with the oil through contaminated vehicles and clothing and through inhalation. Special municipal and government telephone lines were set up so that questions from the public could

be answered; callers' names were obtained and a standard questionnaire, which had been quickly developed to determine the severity of exposure, was administered.

The use of a standard questionnaire to assess individual exposure, the inclusion of potentially exposed individuals from multiple sources and the effective administration of emergency procedures, resulted in a systematic recording of exposure data suitable for later analysis.

Results of Surveillance for PCB Exposure

Sixty-four potentially exposed individuals (not including those involved in the road clean-up) were identified. The exposures were categorized according to criteria defined *a priori*. Any skin contact with PCB-containing material, either directly (by touching) or indirectly through contaminated clothing, was defined as a definite exposure. The inhalation route was also considered. However, because the spill occurred outside, the concentration of vapours was not sufficient to pose a significant exposure hazard.

Ten of 64 (15.6 per cent) were confirmed directly exposed. All had minimal contact; they were treated as advised by thorough washing of the exposed surfaces and by the removal and subsequent destruction of clothing. A pregnant complainant with possible inhalation exposure feared damage to her baby. Her blood PCB concentration was normal, as was that of the offspring.

Drinking Water Contamination: Niagara County; Kent, Chatham Counties and Lambton County

The contamination that the Niagara River has sustained from the Love Canal and other sites continues to be a major source of concern to those communities whose drinking water is from the Niagara River. Media attention was focused for a long period of time on the possible effects on cancer and adverse reproductive outcomes that this persistent contamination might have caused. Clusters of several types of cancer were reported. While the assumptions of the public were that their observations of increased cancer rates were correct and that the cause was indeed the drinking water, further assessment of data revealed some reassuring results. Elevations in mortality rates of cancer of the trachea, bronchus and lung in men and women and liver cancer in women were identified in a study carried out by Health and Welfare Canada. The known association of lung cancer and cigarette smoking could explain these findings in part. A subsequent study of female liver cancer, which reviewed individual cases, was conducted because certain chemicals are known to be associated with liver cancer. Thus, this outcome appeared to be coherent with the potential

exposure. This study did not confirm the primary liver cancer excess. Misclassification of many of the cases accounted for the excess.

Reproductive Outcomes in Niagara and Comparison Community

We have previously reported the usefulness of population-based data to identify, validate and monitor environmental health risks. To address other community concerns about possible adverse effects of low-level contamination of the drinking water, we reviewed reproductive outcomes in the Niagara Region and a demographically comparable region with a completely different water supply.

Data on congenital anomalies detected during the first week of life for the years 1975 to 1983, still births for 1970 to 1983, spontaneous abortions for 1976 to 1983 and low birth weight for 1975 to 1983 were obtained from the Surveillance of Congenital Anomalies System (SCAS), the Registrar General's Report on Vital Statistics and the Hospital Medical Records Institute (HMRI). Each indicator of reproductive outcome for Niagara and the comparison region was compared to the province by using standardized reproductive ratios.

Both Niagara and the comparison regions experienced statistically significant elevations of certain anomalies in specific years. However, these elevations were not sustained over time, nor was there consistency of anomaly type.

Provincial rates are based on a large population and tend to be relatively stable. Observed rates in a community are compared to expected rates based on the rates experienced by the province. Because some of the outcomes evaluated have extremely low rates overall, rates for small geographic areas tend to be highly variable. A single case in a small geographic area may be calculated into a statistically significant excess above the provincial rate. This statistical phenomenon must be taken into consideration when interpreting these data (Figures 1-3).

Still birth rates in the Niagara and comparison regions were similar to provincial rates except for 1970, when Niagara's rate was significantly lower than the province's (Figure 4).

Spontaneous abortion rates in both regions remained within expected limits, although during 1977 to 1978 the comparison region experienced lower than expected rates (Figure 5). Both regions had lower than expected rates of low birth-weight infants (<2500 g) from 1980 on.

Figure 1

Congenital Anomalies Rates per 10,000 Births for the Province of Ontario, Niagara and Comparison Regions 1975-1983

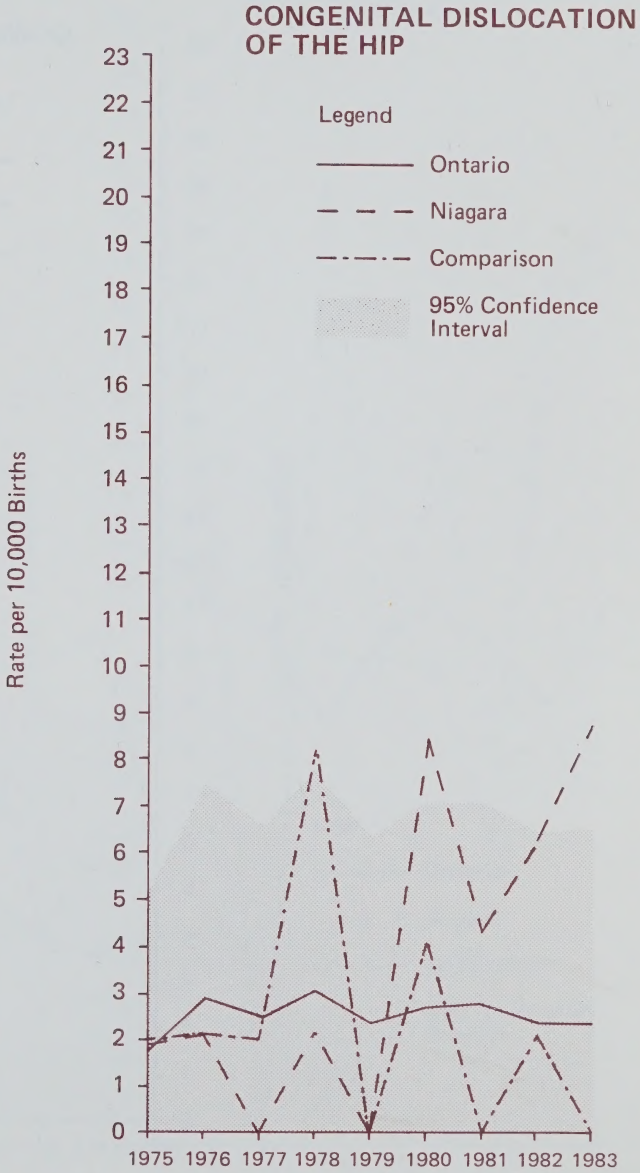


Figure 2

Congenital Anomalies Rates per 10,000 Births for the Province of Ontario, Niagara and Comparison Regions 1975-1983

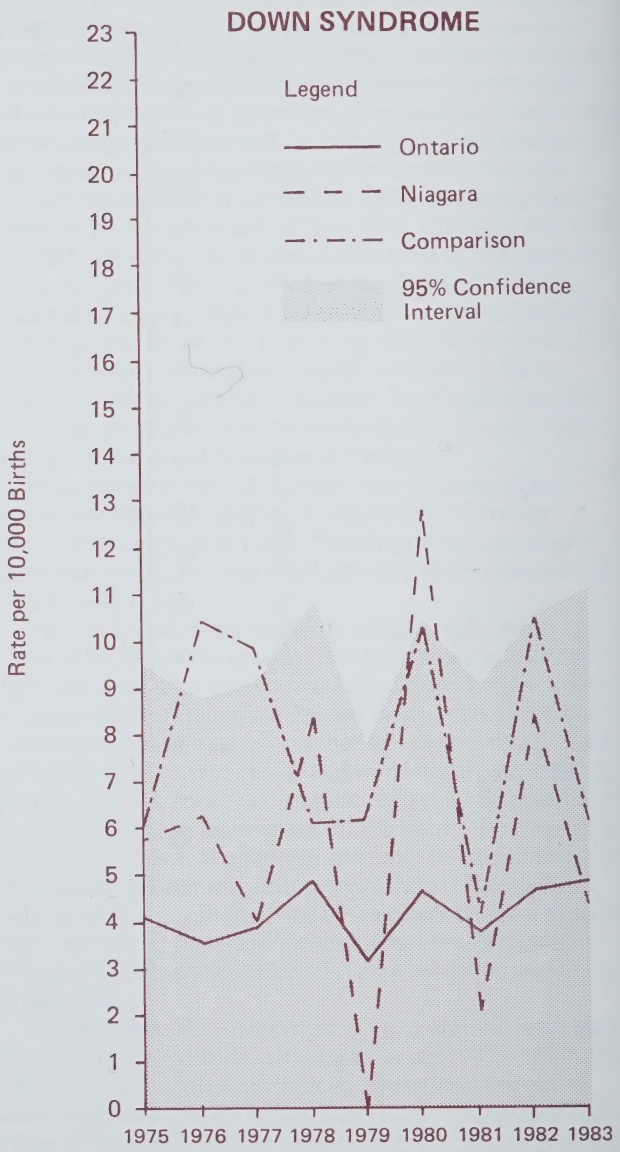


Figure 3

Congenital Anomalies Rates per 10,000 Births for the Province of Ontario, Niagara and Comparison Regions 1975-1983

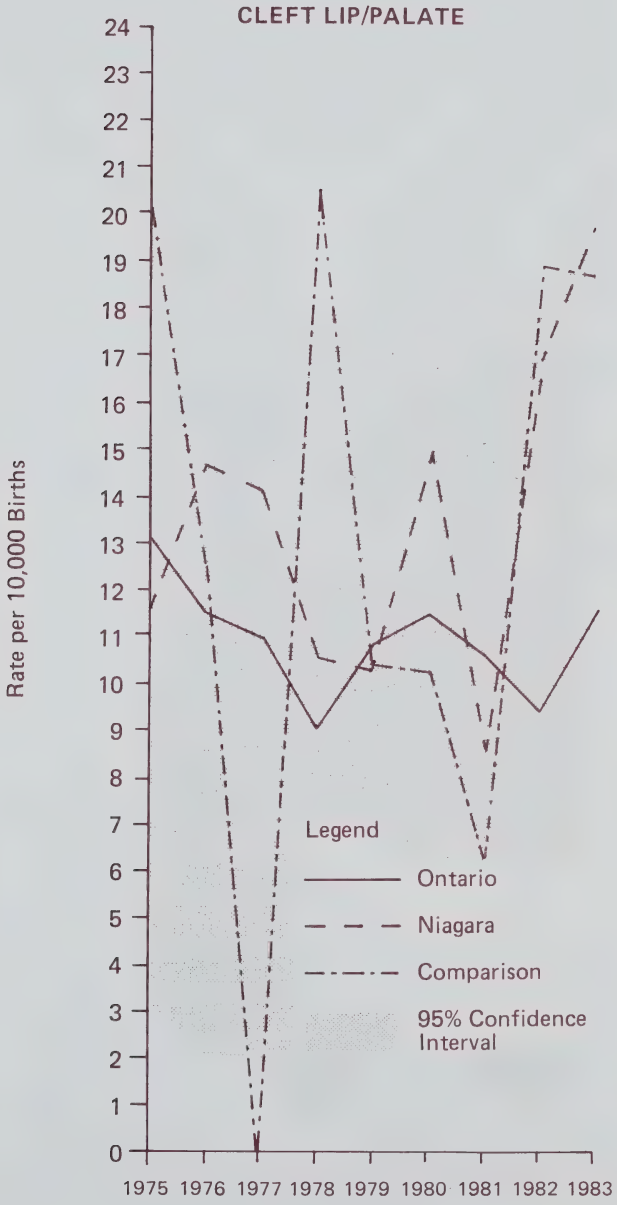
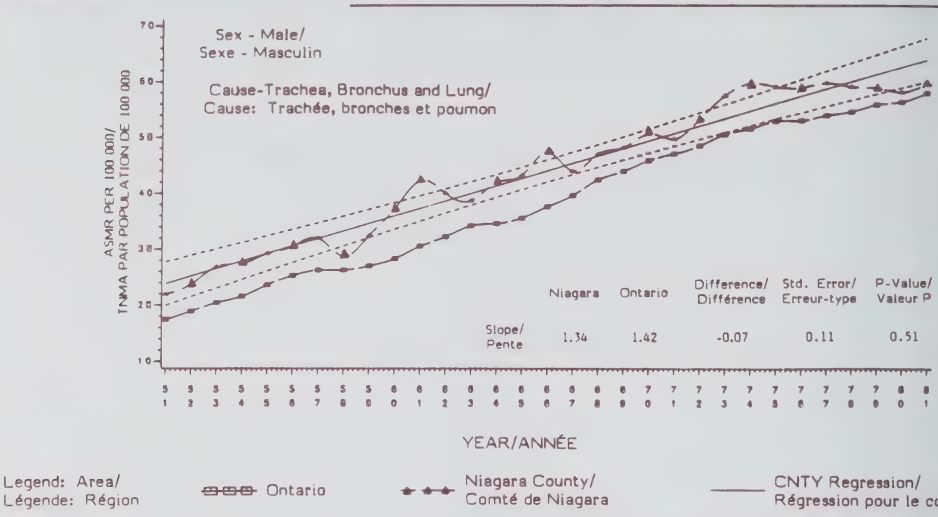


Figure 4

Niagara County Three-Year Moving Average

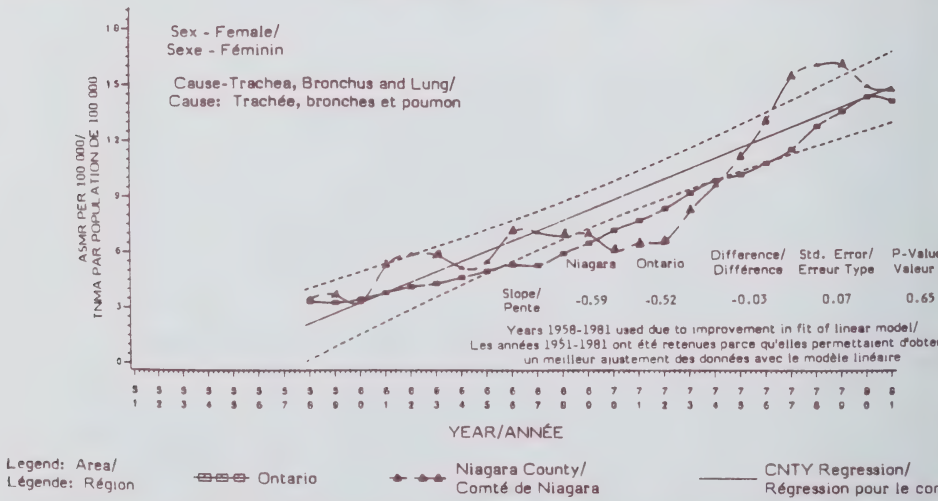


With 95 percent regression confidence limits for local mean based on individual year/
Régression faite avec une limite de confiance de 95 pour cent pour la moyenne régionale fondée sur l'année

Source: Health and Welfare Canada. Cancer Mortality in Niagara County, Ontario. 1951-1986. Special Report No. 5. *Chronic Diseases in Canada*. Bureau of Epidemiology, LCDC, Health and Welfare Canada, Ottawa. 1984.

Figure 5

Niagara County Three-Year Moving Average



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Régression faite avec une limite de confiance de 95 pour cent pour la moyenne régionale fondée sur l'année

Source: Health and Welfare Canada. Cancer Mortality in Niagara County, Ontario. 1951-1986. Special Report No. 5. *Chronic Diseases in Canada*. Bureau of Epidemiology, LCDC, Health and Welfare Canada, Ottawa. 1984.

Although Niagara experienced elevated rates of certain anomalies, there was lack of clustering within the two municipalities of the five Niagara municipalities that used the Niagara River as the sole source of drinking water. This lack of clustering within Niagara and the occurrence of a similar anomaly excess in the comparison region with a totally different water source do not support an association between the Niagara River water alone and the occurrence of the anomaly. This is not surprising in view of what is known about the patterns of occurrence of congenital anomalies. Association between maternal age and Down Syndrome has been documented. In addition, certain other anomalies have been associated with maternal and paternal occupation, maternal life style and genetic history. Although there are a number of chemicals and therapeutic agents that have been demonstrated as human teratogens, there is not much evidence at this time that congenital anomalies have increased with the increased exposure to low concentrations of chemicals as found in the general environment. None the less, the examination of birth defect patterns in relation to general environmental factors can guide the subsequent exploration of other hypotheses and the examination of other risk factors that may be operating in a specific population.

Studies using population-based registries, such as SCAS, are necessarily limited to observational and correlational analyses. Direct cause and effect relationships between environmental events and measures of health in a population cannot be established by routine surveillance through these systems alone. However, these data bases can be used to identify individuals so that analysis of data with adjustment for specific exposures and other risk factors may subsequently be carried out. The study that follows exemplifies this approach.

Reproductive Outcomes in Southwestern Ontario, 1980 to 1985

A study of reproductive outcomes currently being carried out by the University of Western Ontario (funded by the Ontario ministries of Health and Environment) is an example of a further application of the principles described.

Reproductive outcomes can be examined through a historical prospective and case-control methodology, using the SCAS data base. Individuals may be accessed through the Registrar General and through their personal physicians as long as permission is obtained and confidentiality is assured. Reproductive outcomes can be related

to specific toxic spill exposure at the time of conception and during pregnancy. These analytic epidemiologic methods assess the potential relationship between drinking water source and reproductive outcomes, making specific adjustments usually not possible through descriptive studies.

Conclusions

The concerns of the public are focused on immediate and direct actions to prevent passive exposures to contaminants in the general environment. The public often appears not to appreciate the complex interactions that operate in real life and the limits of the epidemiologic methods used to help clarify cause-effect relationships between passive exposures and health outcomes. Scientists do not have all the answers. Some concerns may be addressed through the maintenance of adequate population-based health data, which may be used for descriptive and analytic studies. The interpretation of studies, no matter how complex, is highly limited. These limits must be communicated clearly to the public, both before and after a study is carried out. There is a need for government to anticipate and respond to public concerns about passive environmental exposures.

In our experience, the important actions in the management of these issues are: the assignment of responsible local authorities as lead agencies working with strong central support, the maintenance of adequate central resources in toxicology and epidemiology to provide this support, the encouragement of close inter-agency co-operation, the early definition of scientifically sound plans to monitor and assess health effects, the assurance that efforts are being made to prevent future mishaps, and, most importantly, from the public perspective, to maintain open communication directly with them and through the media.

Résumé

Cet article a été présenté au 19^{e} symposium annuel de la Société de toxicologie du Canada. Dans cet article, les auteurs présentent certains des problèmes qui se posent dans l'intervention en cas de pollution accidentelle et dans la façon dont le ministère de la Santé s'occupe de situations de ce genre avec les organismes locaux. Certains cas précis y sont étudiés.

Acknowledgement

The editorial board of Occupational Health in Ontario wishes to thank the Society of Toxicology in Canada for permission to print this article, which was first presented

at the Society's 19th Annual Symposium, December 2 to 3, 1986 in Montreal, Quebec.

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Smoking Survey of Ministry of Labour Employees

Summary

The results of a survey of Ministry of Labour employees' viewpoints on smoking in ministry premises are presented. Employees were of the opinion that smoking should be restricted to designated areas that are ventilated so that exposure to secondhand smoke generated within ministry premises does not occur.

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Introduction

Inhalation of tobacco smoke during active cigarette smoking is the largest single preventable cause of death and disability in the United States and Canada. The health consequences of the active use of tobacco have been documented and widely publicized for many years. More recently, concern and attention have been extended to include the health risks associated with involuntary exposure to environmental tobacco smoke.

In 1985 a review of the health effects of involuntary exposure to tobacco smoke was undertaken by the Special Studies and Services Branch of the Ministry of Labour. It was concluded that tobacco smoke induced adverse effects on the health of those exposed to it, and the recommendation that 'long-term exposure to secondhand tobacco smoke in the workplace should be minimized or avoided'[1] was made. The findings of this study are in agreement with the conclusions presented in the Surgeon General's Report 1986.[2]

In response to the recommendation presented in the Ministry of Labour report[1] the Executive Committee (now called Management Committee) of the Ministry of Labour appointed a working group to address the issues related to involuntary exposure to tobacco within Ministry of Labour premises. The working group recommended that a survey of ministry employees be conducted in order to determine their smoking habits and to establish their views concerning smoking within ministry premises.

A team was set up to carry out this survey. A questionnaire was designed for distribution to all ministry employees. This was tested and revised as necessary. A copy of the final questionnaire is presented as Appendix 1.

Distribution and Return of Questionnaire

Questionnaires were distributed with pay cheques on October 16, 1986. The definition of an employee of the ministry was extended to include those civil servants who work regularly in the ministry. This would include, for example, lawyers who are employed by the Ministry

of the Attorney-General and who work in the Legal Branch of the Ministry of Labour, as well as students and unclassified staff.

There were 1,595 questionnaires distributed, and, as of October 30, 1986, 1,296 questionnaires were returned to the Special Studies and Services Branch. Of the returned questionnaires, 1,294 were considered to be valid.

The response rate of 81 per cent is very high for a self-administered questionnaire. This high response rate gives us confidence that the results of the survey validly represent the opinion of ministry employees on this issue.

Tabulation of Data

The data on the questionnaires were keypunched into a micro-computer to tabulate the results. During the keying of the data, it was noticed that two completed questionnaires were photocopied from a third original. These two questionnaires were omitted, leaving 1,294 questionnaires for tabulation.

In order to detect keying errors, the data on a sample of the questionnaires were compared to the data contained in the computer files. There were four keying errors found in the 10 per cent of questionnaires sampled, and these errors were corrected. There are 22 data entries in each questionnaire, and the number of errors found represents an error rate per data entry of 0.1 per cent.

Results of the Survey

Although a great many tabulations are possible from the data, only the important features of the data are given in the tables located at the end of the report.

Table 1 illustrates the number of respondents who are current smokers, former smokers and those who have never smoked.

Table 1 **Smoking Habits of Respondents**

Category	Number	%
Former smoker	412	33
Current smoker	329	26
Never smoker	526	42
Total responses	1267	101
No response	27	
Total	1294	

Table 2 shows the number of cigarettes smoked per day in ministry premises by current smokers.

Table 2

Cigarettes Smoked per Day Within Ministry Premises

Cigarettes Smoked per Day Within Ministry Premises	Current Smokers	%
0	48	15
1-4	50	16
5-9	85	26
10-19	88	27
20+	50	16
Subtotal	321	100
Unknown	8	
Total	329	

Table 3 compares the attitudes of smokers and non-smokers to smoking in the work area. The responses of finding smoking 'objectionable' or 'bothersome' were combined and the responses 'not affected' or 'acceptable' were combined to form two categories, which are compared graphically in Figure 1.

Table 3

Attitudes of Smokers and Non-smokers To Smoking in the Work Area

	Smokers		Non-smokers	
Attitude	Number	%	Number	%
Object	10	3	379	40
Bothersome	15	5	360	38
Not affected	120	39	137	15
Acceptable	166	53	60	6
Total	311	100	936	99
No response	18		19	
Total*	329		955	

***Note:** 10 respondents did not respond to the question about their current smoking habits.

Figure 1

Attitudes to Smoking in the Workplace

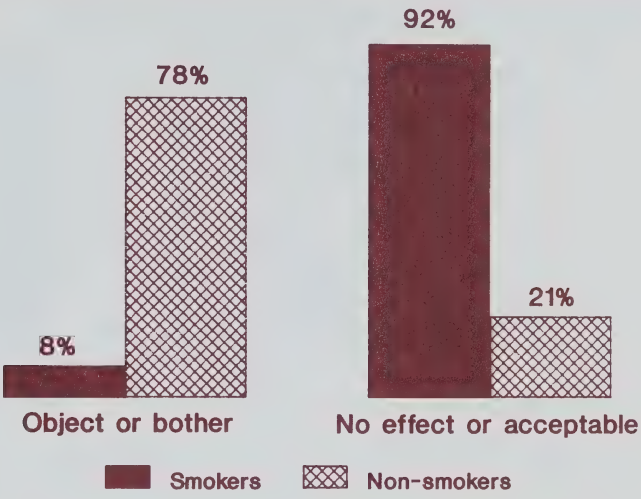


Table 4 shows the responses of smokers and non-smokers to the questions about various alternatives with respect to smoking within ministry premises. The responses to the questions about restrictions and designated smoking areas were combined; an affirmative answer to either question was interpreted as favouring a restriction of smoking in ministry premises. These data are also shown in Figure 2.

Table 4

Opinions of Respondents on Smoking Alternatives Within Ministry Premises

Alternatives	Smokers		Non-smokers	
	Number	%	Number	%
Ban	8	3	285	31
Restrict	188	59	590	63
Allow	124	39	55	6
Total responses	320	100	930	100
No response	9		25	
Total	329		955	

Figure 2

Attitudes to Possible Alternatives

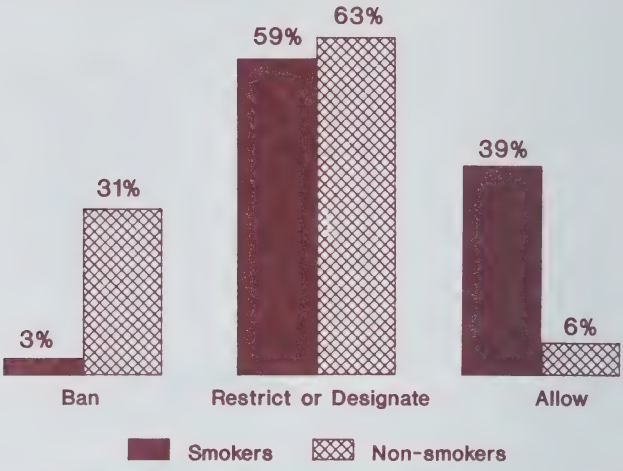


Table 5 shows the responses of smokers and non-smokers to the question of smoking in various parts of the ministry's premises. Figure 3 also describes these data.

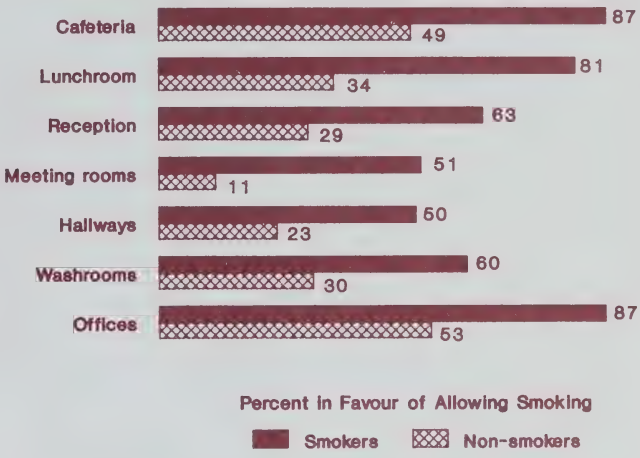
Table 5

Attitudes of Smokers and Non-smokers to Allowing Smoking in Various Parts Within Ministry Premises*

Area	Smokers Number	%	Non-smokers Number	%
Cafeteria	243	87	404	49
Lunchroom	214	81	265	34
Reception area	158	63	222	29
Meeting rooms	127	51	81	11
Hallways	122	50	178	23
Washrooms	155	60	238	30
Offices	257	87	437	53

***Note:** Not all respondents answered this question.

Figure 3 **Attitudes to Smoking in Different Areas**



There were 168 smokers (56 per cent) who indicated that they would voluntarily participate in a program designed to help them stop smoking. Of the 225 respondents who smoked in their work area and who answered the question about whether they would be able to refrain from smoking within ministry premises, 104 (46 per cent) indicated that they could refrain.

Discussion

The survey results show that 26 per cent of the ministry employees are current smokers and that more than half (59 per cent) are either current or former smokers. These data are in agreement with the results of other surveys. The observation that more than half of the survey respondents are current or past smokers is important because people who have given up smoking are usually understanding of the difficulty that some smokers would experience if a policy restricting or banning smoking within Ministry of Labour premises were to be adopted. This is indeed reflected by the comments on the questionnaires, and is of major importance when a policy is being considered by the ministry.

It is of interest to note that the majority of current smokers consume more than five cigarettes per day 'within ministry premises'. Unfortunately, the questionnaire does not allow us to evaluate how many cigarettes are smoked in the work area.

Forty-six percent of those who smoke in their work area feel they could refrain from smoking within ministry

premises, and so, it can be assumed, from smoking in their work area.

The attitude to smoking within ministry premises is strongly related to smoking habits. As can be seen in Figure 1, the majority of non-smokers (78 per cent) either object to smoking or find it to be bothersome, while a small number of smokers (eight per cent) express this viewpoint. Conversely, almost all smokers (92 per cent) are either not affected or find smoking acceptable, while fewer non-smokers (21 per cent) feel this way.

It is interesting to note the attitudes of both smokers and non-smokers to the various smoking alternatives presented in the questionnaire. It is clear from Table 5 and Figure 2 that the majority of both smokers and non-smokers favour the allocation of specially designated smoking areas (59 per cent and 63 per cent respectively). A considerable number of non-smokers (31 per cent) would favour a ban; similarly, a considerable number of smokers (39 per cent) are in favour of allowing smoking within ministry premises.

Respondents were invited to submit comments for consideration. Six hundred and twelve of the 1,294 valid returns contained some comment. Since the nature of the comments solicited was purposely unspecified, they varied considerably in their content and ranged from criticism of the questionnaire to lengthy discussions of the rights of smokers and non-smokers. In general, the majority fell into a few categories. These were quantified. It is important, when considering these results, to remember the way in which the comments were collected and that they were submitted by respondents with different levels of technical knowledge.

The strong interest in the provision of designated smoking areas expressed in the responses was echoed in the comments. Two hundred and thirty five (38 per cent) of the 612 respondents who commented mentioned this further.

Thirty-two (14 per cent) of these 235 stipulated that designated smoking areas should be provided with 'separate ventilation' and 68 (29 per cent) stated that these areas should be 'vented directly to the outside'. What is meant by 'separate ventilation' is not always clear; in some cases, the recommendation is coupled with the comment that no exposure to secondhand smoke should occur.

With respect to other comments on air quality, 11 (two per cent) of the 612 respondents who commented felt that air purifiers should be provided, and 39 (six per cent) were of the opinion that 'improved', 'proper' or 'adequate'

ventilation would be sufficient to cope with secondhand smoke. One per cent of respondents who submitted comments felt that the ministry should provide education for all employees on the hazards related to smoking.

The comments sometimes addressed the issue of utilization of certain areas as smoking areas. While the responses in general indicated that the cafeteria is a place commonly considered as suitable for designation as a smoking area (see Figure 3), several of the comments specified that this would only be acceptable if the cafeteria has either 'proper', 'adequate', or 'separate' ventilation or is ventilated 'directly to the outside'.

A high percentage of both smokers and non-smokers expressed the opinion that, in the event of a smoking restriction policy being adopted by the ministry, smoking should be permitted in personal offices. At the same time, however, the comments demonstrated a very strong feeling that all 'designated smoking areas' should be ventilated so that exposure of employees to secondhand smoke does not occur.

Slightly more than half of the current smokers expressed an interest in taking part in a smoking-cessation program. While this demonstrates a desire by a considerable percentage of smokers to stop smoking, it also demonstrates the need to consider those who do not wish to stop, and, at the same time, to protect other employees from exposure to cigarette smoke.

Summary of the Survey Results

At this time, the employees of the Ministry of Labour are of the opinion that:

1. The Ministry of Labour should adopt a policy that would restrict smoking in its premises.
2. A total ban on smoking within ministry premises is not appropriate.
3. Certain areas within ministry premises should be designated as smoking areas.
4. Designated smoking areas should be ventilated so that ministry employees are not exposed to secondhand smoke generated within ministry premises.

Appendix 1

CONFIDENTIAL WHEN COMPLETED

ONTARIO MINISTRY OF LABOUR
SMOKING QUESTIONNAIRE

The Ministry of Labour is conducting a survey on smoking in its premises and is interested in your viewpoint.

You are invited to participate by completing the following questionnaire. Please return the completed, pre-addressed form to the Special Studies and Services Branch as early as possible and no later than October 23, 1986.

Please remember that if you do not respond to this questionnaire your opinion on smoking in the work environment cannot be considered.

For the purpose of this questionnaire, a work area is defined as that space within Ministry of Labour premises in which a Ministry of Labour employee performs job duties and includes both open and enclosed spaces.

Please circle your answer to each question.

1 Do you spend the majority of your working day inside Ministry of Labour premises? ..... Y N

2 Is smoking currently prohibited or restricted in your work area? ..... Y N

3 How do you feel about smoking in your work area? Circle one response.

a) I object to it
b) It bothers me
c) It does not affect me
d) I find it acceptable

4 Do you think the Ministry of Labour should

a) allow smoking within its premises? ..... Y N
b) restrict smoking within its premises? ..... Y N
c) ban smoking completely within its premises? ..... Y N
d) allow smoking only in designated areas within its premises? ..... Y N

5 If a policy allowing designated smoking areas were adopted, should smoking be allowed in

a) cafeterias? ..... Y N
b) lunch rooms? ..... Y N
c) reception areas? ..... Y N
d) meeting rooms? ..... Y N
e) hallways? ..... Y N
f) washrooms? ..... Y N
g) personal offices? ..... Y N

6 a) Do you smoke? . . . . . Y N

b) Have you ever smoked? . . . . . Y N

c) Do you presently smoke in your work area? . . . . . Y N

d) Circle the number of cigarettes you smoke per day within Ministry of Labour premises.

none 1-4 5-9 10-19 20+

e) Would you be able to refrain from smoking within Ministry of Labour premises? . . . . . Y N

7 If you are a smoker, would you voluntarily participate in a smoking cessation program? . . . . Y N

8 Which office do you work out of? _____

9 Please write down any other comments which might help in setting a fair policy on smoking within Ministry of Labour premises.

_____

_____

Thank you for your co-operation in completing this questionnaire.

Résumé

Voici les résultats d'une enquête menée auprès des employés du ministère du Travail pour connaître leurs points de vue sur l'usage du tabac en milieu de travail. Selon les employés, on ne devrait pouvoir fumer que dans les endroits désignés, qui soient ventilés de façon adéquate afin de ne pas exposer les non-fumeurs aux effets du tabac dans les locaux du ministère.

References

[1]House R. The Health Effects of Involuntary Exposure to Tobacco Smoke, Health Studies Service, Special Studies and Services Branch, Ministry of Labour. 1985.

[2]Office of Smoking and Health. The Health Consequences of Involuntary Smoking: A Report of the Surgeon General, Rockville, Maryland: PHS 1986.

Exposure Standards for CO, Methylene Dianiline, Anaesthetic Gases and PCBs

Summary

The Regulation respecting Exposure to Hazardous Chemical and Biological Agents (Ontario Regulation 654/86) set exposure standards for some chemicals lower than the guidelines recommended by the American Conference of Governmental Industrial Hygienists. This article summarizes the rationale for the exposure standards chosen.

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Carbon Monoxide

Carbon monoxide (CO) exerts its toxic effects on mammals by competing with oxygen for haem compounds, particularly haemoglobin. It forms a strong co-ordination bond with the iron atom of the protohaem complex in haemoglobin, forming carboxyhaemoglobin (COHb). The relative affinity of haemoglobin for CO as compared to that of oxygen in humans is about 246 to one. In having this greater affinity for binding sites on the haemoglobin, CO can thus seriously interfere with the oxygen carrying capacity of the blood. Furthermore, the COHb interferes with the releases of already bound oxygen at the tissue level, thus exacerbating an already toxic situation.

Various investigations have documented and correlated exposure to carbon monoxide, level of activity and blood COHb levels. (Tables 1, 2, 3, 4.)

The American Conference of Governmental Industrial Hygienists (ACGIH) has set a Threshold Limit Value – Time-Weighted Average (TLV-TWA) for carbon monoxide at 50 ppm. This TLV-TWA concentration may produce a blood carboxyhaemoglobin level between 7.3 per cent and 8.3 per cent when performing heavy work. These carboxyhaemoglobin values have been shown to produce undesirable behavioural changes and changes in work performance and may aggravate symptoms in patients with pre-existing cardiovascular disease as illustrated in Table 5.

To protect workers with chronic heart disease and prevent adverse effects on the normal cardiovascular system, NIOSH (1972),[3] in its criteria document for carbon monoxide, recommends a work environment standard of 35 ppm as a TWA exposure value. This NIOSH standard produces carboxyhaemoglobin values between 5.3 per cent and 5.8 per cent when performing heavy work. These carboxyhaemoglobin levels should prevent possible cardiovascular and also behavioural changes.

The carboxyhaemoglobin levels associated with this guideline are safer for the foetus of a pregnant worker as well. Exposure of pregnant workers to 35 ppm for eight hours while engaged in light work may give rise to

COHb levels of 5.3 per cent. The blood COHb level would not rise beyond 5.3 per cent, even while pregnant workers are engaged in heavy work for more than 24 hours. The time taken for total COHb to reach its final value exceeds eight hours, by which time the work shift would be over, and the foetal COHb of a non-smoking mother would therefore be under five per cent. Foetal death or gross foetal damage (mainly neurological), which has been reported, has occurred at CO exposures resulting in maternal carboxyhaemoglobin levels ranging from 20 to 95 per cent. Similarly, the greater incidence of low birth-weight babies (200 gm or more below the average birth weight of 3,500 gm), spontaneous abortions, still births and possible later learning problems in living children is associated with CO exposure of mothers who often have COHb levels greater than 5.3 per cent. These sequelae have been reported through studies on smoking mothers with COHb ranging from two per cent (under 10 cigarettes a day) to 14 per cent (over 30 cigarettes a day). There are also the compounding effects of nicotine and other ingredients of cigarettes on placental circulation. Thus the chronic 24-hour effect of smoking is different from that of intermittent occupational CO exposure in a healthy non-smoking mother.

It is to be noted, however, that this guideline does not prevent the possible health effects noted above in workers who smoke, for smokers may enter their occupational environment with a COHb concentration higher than 5.3 per cent. If the worker's COHb is at a higher level than can be maintained by the ambient CO concentration and the worker refrains from smoking during the shift, the COHb level will diminish. However, if smoking occurs during the shift, the COHb level is usually maintained and is not affected by the lower concentration of CO in the workplace.

The Ontario Ministry of Labour has followed an occupational exposure guideline of 35 ppm as a TWA since 1976. This exposure guideline should prevent possible cardiovascular and behavioural changes and also possible foetotoxicity in exposed pregnant workers.

Table 1 Expected COHb values under different conditions at rest (alveolar ventilation: 6 l/min, diffusion capacity: 30 ml/min), light work (alveolar ventilation: 18 l/min; diffusion capacity: 40 ml/min) and heavy work (alveolar ventilation: 30 l/min, diffusion capacity: 60 ml/min). Height: 175 cm; weight: 75 kg (blood volume: approx. 5.5 l), haemoglobin: 15 g/100 ml; barometric pressure: 750 mmHg; affinity constant for CO: 218; COHb.: 0.5%.[1]

duration	*200 ppm*			*100 ppm*			*75 ppm*			*50 ppm*		
	r	*lw*	*hw*	*r*	*lw*	*hw*	*r*	*lw*	*hw*	*r*	*lw*	*hw*
15 min	1.7	3.2	4.7	1.1	1.8	2.6	0.9	1.5	2.0	0.8	1.2	1.5
30 min	2.8	5.7	8.3	1.7	3.1	4.4	1.4	2.4	3.4	1.1	1.7	2.4
45 min	3.9	7.9	11.2	2.2	4.2	5.9	1.8	3.2	4.5	1.3	2.3	3.1
60 min	5.0	9.8	13.6	2.7	5.2	7.1	2.2	4.0	5.4	1.6	2.8	3.7
90 min	6.9	13.1	17.2	3.7	6.8	9.1	2.9	5.2	6.9	2.1	3.6	4.7
2 h	8.7	15.6	19.5	4.6	8.2	10.4	3.6	6.3	8.0	2.5	4.3	5.5
4 h	14.3	21.0	23.0	7.5	11.4	12.8	5.7	8.8	9.9	4.0	6.0	6.8
6 h	17.8	22.9	23.7	9.5	12.7	13.4	7.3	9.8	10.4	5.0	6.7	7.2
8 h	20.0	23.5	23.8	10.8	13.2	13.5	8.3	10.2	10.5	5.7	7.1	7.3
24 h	23.8	23.9	23.9	13.6	13.6	13.6	10.6	10.6	10.6	7.3	7.3	7.3

duration	*35 ppm*			*25 ppm*			*10 ppm*			*5 ppm*		
	r	*lw*	*hw*	*r*	*lw*	*hw*	*r*	*lw*	*hw*	*r*	*lw*	*hw*
15 min	0.7	0.9	1.2	0.6	0.8	1.0	0.5	0.6	0.7	0.5	0.5	0.5
30 min	0.9	1.4	1.8	0.8	1.1	1.4	0.6	0.7	0.8	0.5	0.6	0.6
45 min	1.1	1.7	2.3	0.9	1.3	1.7	0.6	0.8	0.9	0.6	0.6	0.6
60 min	1.3	2.1	2.7	1.0	1.6	2.0	0.7	0.9	1.0	0.6	0.6	0.7
90 min	1.6	2.6	3.4	1.3	2.0	2.5	0.8	1.0	1.2	0.6	0.7	0.7
2 h	1.9	3.1	3.9	1.5	2.3	2.9	0.8	1.1	1.3	0.6	0.7	0.7
4 h	2.9	4.3	4.9	2.2	3.1	3.5	1.1	1.4	1.5	0.7	0.8	0.8
6 h	3.6	4.8	5.1	2.7	3.5	3.7	1.3	1.5	1.6	0.8	0.8	0.8
8 h	4.1	5.1	5.2	3.1	3.7	3.8	1.4	1.6	1.6	0.9	0.9	0.8
24 h	5.3	5.3	5.3	3.9	3.9	3.9	1.6	1.6	1.6	1.0	1.0	1.0

r = rest
lw = light work
hw = heavy work

Table 2

Expected COHb values under different conditions at light work (alveolar ventilation: 18 l/min; diffusion capacity: 40 ml/min), COHb.: 5%. Height: 175 cm; weight: 75 kg (blood volume: approx. 5.5 l), haemoglobin: 15 g/100 ml; barometric pressure: 750 mmHg; affinity constant for CO: 218.[1]

	200 ppm	*100 ppm*	*75 ppm*	*50 ppm*	*35 ppm*	*25 ppm*	*10 ppm*	*5 ppm*
15 min	7.3	5.9	5.6	5.2	5.0	4.9	4.7	4.6
30 min	9.3	6.7	6.1	5.4	5.1	4.8	4.4	4.3
45 min	11.1	7.5	6.6	5.6	5.1	4.7	4.1	4.0
60 min	12.7	8.1	7.0	5.8	5.1	4.6	3.9	3.7
90 min	15.3	9.2	7.7	6.1	5.1	4.5	3.5	3.2
2 h	17.4	10.1	8.2	6.3	5.2	4.4	3.2	2.8
4 h	21.6	12.2	9.6	6.9	5.2	4.1	2.4	1.8
6 h	23.1	13.0	10.2	7.1	5.3	4.0	2.0	1.3
8 h	23.6	13.4	10.4	7.2	5.3	3.9	1.8	1.1
24 h	23.9	13.6	10.6	7.3	5.3	3.9	1.6	0.9

Table 3

Expected COHb values under different conditions at light work (alveolar ventilation: 18 l/min; diffusion capacity: 40 ml/min) for a small person (height: 165 cm; weight: 55 kg; blood volume: approx. 4 l) with low haemoglobin value (11 g/100 ml). Barometric pressure: 750 mmHg; affinity constant for CO: 218; COHb.: 0.5%.[1]

	200 ppm	*100 ppm*	*75 ppm*	*50 ppm*	*35 ppm*	*25 ppm*	*10 ppm*	*5 ppm*
15 min	5.3	2.9	2.3	1.7	1.3	1.1	0.7	0.6
30 min	9.3	4.9	3.8	2.6	2.0	1.5	0.8	0.6
45 min	12.5	6.5	5.0	3.5	2.5	1.9	1.0	0.7
60 min	15.0	7.9	6.0	4.1	3.0	2.2	1.1	0.7
90 min	18.5	9.8	7.5	5.1	3.7	2.7	1.2	0.7
2 h	20.6	11.1	8.5	5.8	4.2	3.1	1.4	0.8
4 h	23.4	13.1	10.2	7.0	5.0	3.7	1.6	0.9
6 h	23.8	13.5	10.5	7.3	5.2	3.8	1.6	0.9
8 h	23.9	13.6	10.6	7.3	5.3	3.8	1.6	0.9
24 h	23.9	13.6	10.6	7.3	5.3	3.9	1.6	0.9

Table 4 [HbCO] values predicted from Coburn et al. (1965) model[2]

time	200 ppm			100 ppm			75 ppm			50 ppm		
	S	*L*	*H*	*S*	*L*	*H*	*S*	*L*	*H*	*S*	*L*	*H*
15 min	1.8	3.5	5.2	1.2	2.0	2.8	1.0	1.6	2.2	0.82	1.2	1.6
30 min	3.1	6.2	9.2	1.8	3.3	4.8	1.5	2.6	3.7	1.1	1.9	2.6
45 min	4.3	8.7	12.6	2.4	4.6	6.5	1.9	3.5	4.9	1.4	2.5	3.4
60 min	5.5	11.0	15.5	3.0	5.7	7.9	2.3	4.3	6.0	1.7	3.0	4.1
90 min	7.7	14.9	20.2	4.0	7.6	10.2	3.1	5.8	7.7	2.2	4.0	5.2
2 h	9.7	18.1	23.7	5.0	9.2	11.9	3.9	7.0	9.0	2.7	4.7	6.1
4 h	16.3	26.2	30.4	8.3	13.2	15.3	6.3	10.0	11.5	4.4	6.9	7.7
6 h	21.1	30.0	32.4	10.7	15.1	16.2	8.1	11.3	12.2	5.5	7.6	8.2
8 h	24.5	31.7	32.9	12.4	15.9	16.5	9.4	12.0	12.4	6.4	8.0	8.3
24 h	32.7	33.2	33.2	16.5	16.7	16.6	12.4	12.5	12.5	8.4	8.4	8.3
∞	33.4	33.2	33.2	16.8	16.7	16.6	12.7	12.5	12.5	8.5	8.4	8.3

time	35 ppm			25 ppm			10 ppm			5 ppm		
	S	*L*	*H*	*S*	*L*	*H*	*S*	*L*	*H*	*S*	*L*	*H*
15 min	0.72	1.0	1.3	0.66	0.84	1.0	0.55	0.61	0.67	0.52	0.54	0.56
30 min	0.93	1.4	1.9	0.80	1.2	1.5	0.61	0.72	0.82	0.54	0.57	0.60
45 min	1.1	1.9	2.5	0.95	1.4	1.9	0.66	0.81	0.95	0.56	0.61	0.64
60 min	1.3	2.2	3.0	1.1	1.7	2.2	0.71	0.90	1.1	0.58	0.63	0.68
90 min	1.7	2.9	3.7	1.3	2.1	2.7	0.80	1.1	1.2	0.62	0.69	0.74
2 h	2.0	3.4	4.3	1.6	2.5	3.1	0.89	1.2	1.4	0.66	0.73	0.78
4 h	3.2	4.7	5.4	2.4	3.4	3.9	1.2	1.5	1.6	0.77	0.84	0.86
6 h	4.0	5.4	5.7	2.9	3.9	4.1	1.4	1.6	1.7	0.85	0.88	0.88
8 h	4.5	5.7	5.8	3.3	4.1	4.2	1.5	1.7	1.7	0.91	0.91	0.89
24 h	5.9	5.9	5.9	4.3	4.2	4.2	1.9	1.8	1.7	1.05	0.93	0.89
∞	6.0	5.9	5.9	4.4	4.2	4.2	1.9	1.8	1.7	1.06	0.93	0.89

S = sedentary subjects, L = light physical work, H = heavy physical work, all as defined in sections 9 and 10.

Table 5

Exposure (HbCO%)	*Reported effects*	*Reference*
(a) Behavioural changes		
20	Essentially no impairment in time discrimination (using Beard-Wertheim task)	Stewart et al. (1973b)
11.3	No vigilance decrement (using Horvath task)	Winneke et al. (1976)
9[a]	No vigilance decrement (using Fodor-Winneke task); no change in reaction time	Winneke (1974)
8.4	No vigilance decrement (using their own vigilance task (1972)	Groll-Knapp et al. (1976)
7.6	Longer reaction times	Ramsey (1973)
7.3	Disturbance in certain perceptual and cognitive processes	Bender et al. (1972)
5	Vigilance decrement	Horvath et al. (1971)
4.5	Longer reaction times	Ramsey (1972)
3.1[b]	Initial vigilance decrement with subsequent normalization; no change in response latency	Fodor & Winneke (1972)
3[b]	Vigilance decrement	Groll-Knapp et al. (1972)
2[b]	Impaired performance in time-discrimination	Beard & Wertheim (1967)
(b) Changes in work performance		
6.3	Decrease in maximal work time	Ekblom & Huot (1972)
4.3 (1.7[c])	Decrease in a maximal oxygen uptake ($\dot{V}_{O_2}$)	Horvath et al. (1975)
4.0 (0.6[c])	Decrease in mean exercise time until exhaustion	Aronow & Cassidy (1975)
2.5	Decrease in absolute exercise time in non-smokers	Drinkwater et al. (1974)
(c) Aggravation of symptoms in patients with cardiovascular disease		
5.1 (1.1[c])	Shortened time to angina response immediately after exposure	Aronow et al. (1972)
2.9 (1.1[c])	Shortened time to angina response 2 h after exposure	Aronow et al. (1972)
2.9 (1.1[c])	Shortened time to angina response	Anderson et al. (1973)
2.8 (1.0[c])	Decrease in mean exercise time until onset of intermittent claudications	Aronow et al. (1974)
2.7	Shortened time to angina response	Aronow & Isbell (1973)

[a] Estimated values using the formula by Coburn et al. (1965).
[b] Estimated values using the formula by Peterson & Stewart (1970).
[c] HbCO % before exposure to CO.

Note: Data taken from Reference 2.

References

[1]Peterson JE, Stewart RD. Predicting the carboxyhaemoglobin levels resulting from carbon monoxide exposures. J Appl Physiol 1975; 39(4):633-638.

[2]Environmental Health Criteria No. 13, Carbon Monoxide. Geneva, World Health Organization, 1979.

[3]National Institute for Occupational Safety and Health – Criteria for a recommended standard: Occupational Exposure to carbon monoxide. U.S.A., 1972.

Methylene Dianiline

The American Conference of Governmental Industrial Hygienists (ACGIH) first introduced Threshold Limit Values (TLVs) for 4,4′-methylene dianiline (synonyms: MDA; 4,4′-diaminodiphenyl methane; DDM; methylene bisphenylamine; CAS 101-77-9) in 1980 as a TLV Time-Weighted Average (TWA) of 0.8 mg/m^3 (0.1 ppm) and as a TLV Short-Term Exposure Limit (STEL) of 4.0 mg/m^3 (0.5 ppm). During the ACGIH development of this exposure guideline, the analysis of Ontario data[1] and that of McGill and Motto[2] led ministry staff to suggest a guideline that appeared to avoid the potential hazard of toxic hepatitis[3]. This guideline was a TWA of 0.04 mg MDA/m^3. This 20-fold stricter guideline was published by the Ontario government in its newsletter, *Workplace,* in 1978,[4] before the ACGIH TLV was announced in 1980. Chronic toxicity tests in rats up to that time were only weakly suggestive of carcinogenicity.[5]

Newer data have appeared, further substantiating the toxicity of MDA[6]. In 1983 the United States National Toxicity Program published a bioassay performed on groups of 50 rats and 50 mice of each sex exposed for two years through drinking water to the water-soluble hydrochloride salt of MDA at levels of 150 and 300 ppm free base equivalent.[7] Significant increases in tumour incidence were observed in the (a) thyroid of rats and mice, both sexes, (b) liver of male rats and mice of both sexes, (c) lymphoid tissue of female mice and (d) adrenal chromaffin tissue of male mice. Also, additional studies[8] in animals indicated that MDA could have either an inhibiting[9] (protective) or a promoting[10] effect on cancer produced by other (nitrosamine) carcinogens, depending on the target tissue and genetics (strain) of animal used. Literature searches have failed to identify any case reports or epidemiological studies of cancer in workers that might reasonably be attributable to MDA exposure.

A case report on one worker appeared in 1985 describing accidental ingestion of a solution of MDA, resulting in

grossly impaired visual activity, with severe deficit of macular vision, colour discrimination and dark adaptation.[11] This case demonstrates that such visual sequelae can be highly disabling. Long-term visual prognosis for this kind of case is poor. Two other minor health effects from MDA have also been recently reported: allergic contact dermatitis[12] and acute photosensitive dermatitis.[13]

Worker exposure leading to toxic effects has been recorded due either to inhalation, skin absorption or ingestion. Consequently, in 1981, the ACGIH added the 'skin' notation, and, in 1984-85, served notice of intent to classify MDA as a suspect human carcinogen and to delete the former TLV-STEL guideline, but to retain its TLV-TWA of 0.8 mg/m^3.

In 1983 the United States Environmental Protection Agency (EPA) and Occupational Safety and Health Administration (OSHA) jointly announced an intention to regulate exposure to MDA; this was the first chemical placed on the Section 4(f) priority list under the *Toxic Substances Control Act* 14-16 (Federal Register: 48FR 42898, September 20, 1983). In July 1985 EPA formally referred MDA to OSHA for action, requesting a determination within 180 days as to whether OSHA would regulate or leave it to EPA to do so.[17] With this referral, EPA sent a report on MDA, which concluded that manufacture and use of MDA present an unreasonable risk of cancer to workers. This regulation has not yet been promulgated.

The current occupational exposure standard in Ontario is a time-weighted average exposure value of 0.04 mg/m^3 with use of appropriate skin protection and work practices. This has been in effect since 1978, and is still 20-fold lower than the current ACGIH TLV-TWA exposure guideline.

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Halothane, Enflurane, Nitrous Oxide

The American Conference of Governmental Industrial Hygienists (ACGIH) in 1980 first served notice of intent to introduce Threshold Limit Value Time-Weighted Average (TLV-TWA) exposure guidelines of 400 mg/m^3 (50 ppm) for halothane and 575 mg/m^3 (75 ppm) for enflurane, two common halocarbon anaesthetics. In all subsequent editions of TLV values, these two exposure guidelines have remained on the list of Notice of Intended Changes. They have never been formally adopted by the ACGIH. No Short-Term Exposure Limit (STEL) or ceiling exposure TLVs have been assigned by the ACGIH for halothane or enflurane.

These values were based on comparisons with the toxicity and potency of two other former anaesthetics, which were also industrial solvents and animal carcinogens: chloroform and trichloroethylene.

A TWA of 50 ppm was recommended for halothane during manufacturing, a type of workplace exposure unlikely to be contaminated by other anaesthetics. In operating rooms, where nitrous oxide (N_2O) is always also present with halothane in the anaesthetic mixture, a lower exposure guideline is required because there is no ACGIH TLV for N_2O. These recommendations did not address hospital staff exposure, and if the normal 50:1 ratio of N_2O to halocarbon were administered under such a guideline, this would permit N_2O levels up to 2,500 to 3,750 ppm, well above levels where toxic effects have been documented.

The ACGIH TLV list is not explicit on this point, but the 1980 TLV Documentation states in each of its

articles on halothane and enflurane that acceptable TWA exposures should be adjusted for the concurrent presence of other waste anaesthetic gases in the operating room.

In 1977 the U.S. National Institute for Occupational Safety and Health (NIOSH) recommended a TWA exposure guideline of 2 ppm for each halogenated vapour used during the administration of anaesthetics, measured by air sampling not to exceed one hour in duration.[1]

The purpose of this sampling time limit was to ensure that sampling occured only while the anaesthetic was being administered and when staff exposure was likely to be the highest. This maximum sampling duration was selected in the belief that most surgical procedures requiring general anaesthesia last only one hour or less. Such a sampling duration limit renders air sampling measurements closer to ceiling measurements (ideally in units of 10 minutes) than to long-term TWA measurements.

NIOSH recommended a 'ceiling' of 2 ppm corresponding to 16.15 mg/m^3 for halothane and 15.1 mg/m^3 for enflurane. NIOSH concluded that if a 50:1 N_2O/halothane ratio were used for anaesthesia, and their TWA for N_2O of 25 ppm was followed, the halothane vapour should be controlled to a TWA of 0.5 ppm.

In 1980 the American Society for Hospital Engineering of the American Hospital Association published a survey of hospital exposures to N_2O and concluded that control of N_2O levels to the NIOSH TWA guideline of 25 ppm was technically feasible. This study assumes that the 50:1 administration ratio applies, and, therefore, control of N_2O exposure within (TWA) 25 ppm will adequately control halocarbons to under 2 ppm.

In 1981 the Occupational Health Branch contracted a pilot study[5] of Ontario hospitals and followed with a much larger, in-depth study of the use of inhalation anaesthetics. These studies revealed, among other things, that:

a) Halocarbon exposures always occur together with exposure to N_2O (so that exposure guidelines set for the pure halocarbon, as in the TLV list, will be insufficient to protect the health of hospital staff in operating rooms).
b) The 50:1 ratio is not followed in practice. The N_2O: halothane ratio observed ranged from 12.5:1 to 153.8:1, whilst the N_2O: enflurane ratio observed ranged from 12.5:1 to 266.6:1. That is, (i) anaesthetic practice is not consistent and (ii) control of the TWA N_2O level to the NIOSH-recommended level of 25 ppm cannot be depended upon to control halocarbon TWA exposures to within the 2 ppm TWA guideline.

c) Surgical procedures usually last more than one hour. This supports long-term air sampling to arrive at a TWA for halocarbon exposure rather than short-term sampling for compliance with a ceiling guideline.

The ministry adopted a modification of the 1977 NIOSH-recommended exposure guidelines, i.e. 2 ppm TWA for halothane and enflurane and a 25 ppm TWA for nitrous oxide (whether above or in combination with one of the halocarbons). These have been in effect since 1981.

References

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Polychlorinated Biphenyls (PCBs)

The American Conference of Governmental Industrial Hygienists[1] (ACGIH) has set a Threshold Limit Value Time-Weighted Average (TLV-TWA) for polychlorinated biphenyls (42 wt. % of chlorine) at 1,000 micrograms per cubic metre (1,000 $\mu g/m^3$) and for polychlorinated biphenyls (54 wt. % of chlorine) at 500 $\mu g/m^3$. However, in 1977, the National Institute for Occupational Safety and Health[2] (NIOSH) has recommended a TWA of 1 $\mu g/m^3$ based on low dose studies in animals.

The decision of NIOSH to recommend a time-weighted average exposure for PCBs of 1 $\mu g/m^3$ was based on evidence that liver tumours are produced in rats and mice that have been exposed to the substance for extended periods of time and on the basis that PCBs act as genotoxic carcinogens (i.e. substances or metabolites that act

directly on the genetic material of a cell, through mutagenic activity). It is believed that there is no safe level of exposure for a genotoxic carcinogen; however, the evidence for the genotoxicity of PCBs is equivocal because the laboratory evidence for mutagenicity is weak.

The NIOSH value has not been adopted by the U.S. Occupational Health and Safety Administration, which still uses the ACGIH exposure limit.

In an appeal hearing in which an order issued by an inspector of the Ontario Ministry of Labour for exposure to PCBs was challenged, the adjudicator considered the health effects information in conjunction with technical matters and ruled for a guideline of 50 $\mu g/m^3$ with skin protection to apply to any mixture of polychlorinated biphenyls.

This is the current occupational standard in Ontario.

Résumé

Le règlement de l'Ontario n° 654/86 concernant l'exposition aux produits chimiques et agents biologiques dangereux (The Regulation respecting Exposure to Hazardous Chemical and Biological Agents) prévoit des limites d'exposition à certains produits chimiques inférieures à celles recommandées par l'American Conference of Governmental Industrial Hygienists. Cet article résume les raisons justifiant les limites choisies.

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A Guide to the Revised Canada Labour Code, Part IV

Summary

Occupational health and safety for employees of the federal government and its agencies and corporations comes under Part IV of the Canada Labour Code. *The following is a guide to explain Part IV and is reprinted with permission of Labour Canada.*

1. Background

Over the past 10 years in Canada, approximately 1,000 workers died every year as a result of workplace accidents. In 1984 direct costs for compensation payments to injured workers totalled $2.5 billion, and associated indirect costs brought the total cost up to approximately $10 billion.

These statistics, which show that workplace safety and health is a serious problem, influenced the revision of the *Canada Labour Code*, Part IV. The intent of this revised law is to reduce workplace injuries and illnesses in federal workplaces and to cut the associated human and economic costs.

The new legislation was drafted in consultation with interested parties, presented to Parliament and passed late in 1984. All parties in the workplace are to comply by the proclamation date, which is planned for March 1986 in the existing jurisdiction and later in 1986 in the extended jurisdiction*.

The major amendments to Part IV (Occupational Safety and Health) are explained in this pamphlet. This is not legal reference. Anyone wishing to interpret the law should refer to Part IV of the *Canada Labour Code* and the regulations issued to supplement Part IV.

2. Coverage

Occupational safety and health in the federal jurisdiction has been consolidated under Part IV of the *Canada Labour Code*. As a result, many more employers and employees are subject to the Code and will receive the benefit of the rights and protections provided by Part IV. The jurisdiction of the Code now covers the following interprovincial and international industries:

- railways;
- highway transport;
- telephone and telegraph systems;
- certain pipelines;

Labour Canada, Ottawa, Ontario

*The revised Code was proclaimed for the existing jurisdiction in 1986 and will be proclaimed for all four sectors of the extended jurisdiction in 1987.

- canals;
- ferries, tunnels and bridges;
- shipping and shipping services;

and certain other industries such as:

- radio and television broadcasting and cable systems;
- airports;
- banks; and
- grain elevators licensed by the Canadian Grain Commission, and certain feed mills and feed warehouses, flour mills and grain seed cleaning plants.

In addition to the above, approximately 40 Crown corporations and agencies are subject to Part IV of the *Canada Labour Code*.

It is planned that the revised Code will apply to this group as of March 1986. In addition, the public service of Canada (via amendments to the *Financial Administration Act*) will be covered by the revised Code as of March 1986.

As well, the revised Code is extended to cover:

- the operation of ships, trains and aircraft;
- the operation of certain pipelines; and
- the exploration and development of petroleum on lands subject to federal jurisdiction, pending the outcome of decisions arising out of the Atlantic Accord.

It is planned that the revised Code will apply to this group later in 1986*.

3. Main Revisions

In the workplace voluntary compliance is encouraged as a positive approach in maintaining work environments that are safe and healthy. Provisions are made in the Code to ensure the active participation of both employees and employers at the local level through workplace safety and health committees or safety and health representatives. Employees' rights are strengthened through the right to refuse dangerous work, the right to know about dangers in the workplace and the right to participate in the control of safety and health hazards in their work environment.

*The revised Code was proclaimed for the existing jurisdiction in 1986 and will be proclaimed for all four sectors of the extended jurisdiction in 1987.

An explanation of the revised Code follows in sections entitled:

A. An Overview of the Revised *Canada Labour Code*;
B. Responsibilities;
C. Occupational Safety and Health Committees/ Representatives; and
D. Employee's Right to Refuse Dangerous Work.

4. Labour Canada Offices

For additional information or assistance, please contact the Labour Canada office nearest you.

A. An Overview of the Revised *Canada Labour Code*

The purpose of Part IV of the *Canada Labour Code* is:

'To prevent accidents and injury to health arising out of, linked with or occurring in, the course of employment.'

This statement is important because it clearly establishes that the emphasis of the revised Part IV is on prevention.

Toward this goal, the following major changes are included in the Code:

- Occupational safety and health in the federal jurisdiction has been consolidated under Part IV of the *Canada Labour Code*;
- Employer and employee duties have been reformulated;
- Safety and health committees or representatives are mandatory for most workplaces;
- Employee involvement in the workplace environment is strengthened through changes to provisions relating to workers' right to know, to participate and to refuse dangerous work;
- The right to request a review of a safety officer's direction is extended to employees and trade unions, as well as employers; and
- Enforcement provisions are changed to promote compliance with Part IV requirements.

1. Consolidation of Federal Occupational Safety and Health Jurisdiction

As stated in the introduction to this booklet, Part IV of the *Canada Labour Code* has been extended to:

- the operation of ships, trains and aircraft;
- the operation of certain pipelines;

- the exploration and development of petroleum on lands subject to federal jurisdiction pending the outcome of decisions arising out of the Atlantic Accord; and
- the federal public service (via amendments to the *Financial Administration Act*).

Part IV now provides the same rights and protections for all employees under federal jurisdiction. However, Part IV will not apply to certain undertakings regulated under the *Atomic Energy Control Act*, which are excluded from Part IV by order-in-council.

Note:
The 'Canada Safety Officer' referred to in this publication means a safety officer designated by the minister for the purposes of Part IV of the *Labour Code*. Where the *Canada Labour Code* refers to a 'safety officer', it means one designated by the Minister of Labour, not a company safety officer.

2. Employer and Employee Duties

Employer and employee duties, formerly spread throughout Part IV and the regulations, are consolidated for easier reference and to emphasize accountability.

3. Employee's Rights

Right to Refuse Dangerous Work

To eliminate confusion over the individual right of an employee to refuse dangerous work, which was first included in the federal legislation in 1978, the word 'imminent' has been deleted from the provision, and a definition of 'danger' has been added. This is intended to make clear that the right can be exercised where a short exposure to a dangerous condition would cause injury or illness, whether symptoms of the illness are apparent immediately or only at a later date.

Right to Know

Through the provisions of the Code, employees have the right to know about known or foreseeable hazards in the workplace and to be provided with the information, instruction, training and supervision necessary to protect their safety and health.

For example, employers are required to:

- provide a safety and health committee or representative with information considered necessary to identify existing or potential hazards;
- post in an accessible place a copy of Part IV of the *Canada Labour Code*, a statement of the employer's safety and health policy, and any other material as directed by Labour Canada;
- provide the safety and health committee or representative with a copy of any written directions or reports from a safety officer, and post them for the information of all employees;
- ensure that every employee is made aware of every known or foreseen safety or health hazard in his or her work area. This would include bomb threats, threats of violence, noise hazards, radiation hazards, airborne contaminants, etc.; and
- ensure that every employee or visitor knows how to use any protective clothing or equipment that is required in the work areas to be occupied or visited.

Through a safety and health committee or representative, employees have the right to have access to government or employer reports relating to the safety and health of employees, but shall not have access to medical records of any person except with that person's consent.

Right to Participate

Through representation on the safety and health committee, or through the safety and health representative, employees have the right to participate in identifying job-related safety and health problems.

4. Mandatory Safety and Health Committees and Exemptions

The employer shall establish a safety and health committee for each workplace at which there are 20 or more employees. Employee members of the committee are to be chosen by the trade union or unions representing employees and by any 'unorganized' employees. Work done by committee members in carrying out their duties as specified in Part IV shall be considered as time on the job and members shall be remunerated accordingly.

The requirement to establish a safety and health committee does not apply to employees normally working on a ship. There are two other possible exemptions from the requirement to establish safety and health committees:

a) a workplace which can be demonstrated to be relatively hazard-free; or
b) a workplace where a committee has been established by employer-employee agreement which fulfils the functions set out in the Code.

5. The Powers and Functions of Safety and Health Committees

A safety and health committee has the following powers and functions under Part IV:

- to deal with safety and health complaints by employees;
- to identify hazards and to regularly monitor workplaces for hazards;
- to monitor records of injuries and illnesses;
- to participate in safety and health related inquiries and investigations;
- to develop, establish and promote safety and health programs and procedures; and
- to obtain information from the employer and from government agencies concerning existing or potential hazards in the workplace.

For committees to be successful, labour and management need to work together in the co-operative resolution of workplace safety and health problems.

6. Mandatory Safety and Health Representatives

A new provision requires the appointment of a safety and health representative for workplaces where five or more workers are employed and no safety and health committee has been established. Where a trade union represents the employees, it will have the principal role in selecting representatives. Where a workplace or ship is exempted from having a committee, there must be a safety and health representative. The information-gathering powers of a safety and health representative are very similar to those of a safety and health committee.

7. Safety Officer's Powers

Any reference in this document to a Canada Safety Officer or a Regional Safety Officer means a person designated by the Minister of Labour under Section 97 of the *Canada Labour Code*. The powers of a Canada Safety Officer have been broadened slightly in order to strengthen the position of the Canada Safety Officer

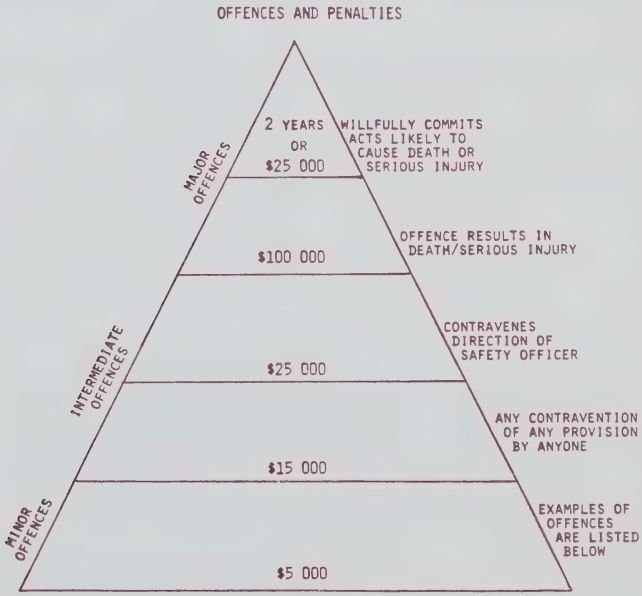
in obtaining information and ensuring compliance with the provisions of the Code. The Canada Safety Officer also has the authority to be accompanied by expert advisers and to be assisted by persons who may have essential information.

8. Review of a Canada Safety Officer's Direction

In the revised Code the right to request that a Canada Safety Officer's direction be reviewed by a Regional Safety Officer is extended to employees and trade unions representing them, as well as to employers.

9. Enforcement

To ensure compliance with Part IV requirements, Canada Safety Officers continue to be empowered to issue directions where Part IV and the regulations are contravened and, where necessary, to recommend prosecution for non-compliance. The enforcement procedures provide for increased maximum fines, which depend on the seriousness of the offence. (See diagram of fines.)



EXAMPLES OF OFFENCES FOR WHICH THERE IS A $5 000 FINE.

EMPLOYER OFFENCES

EMPLOYERS WHO DO NOT:

- POST INFORMATION
- KEEP RECORDS
- PROVIDE SANITARY AND PERSONAL FACILITIES

EMPLOYEE OFFENCES

EMPLOYEES WHO DO NOT:

- CO-OPERATE WITH SAFETY AND HEALTH PERSONS
- REPORT ACCIDENTS

10. Injunction

The Minister of Labour may seek an injunction in the face of serious risk or where a fine would be ineffective in gaining rapid compliance.

11. Regulations

Regulations made pursuant to the Code generally fall into two groups. These include:

- separate industry-specific regulations for the industrial sector being brought under Part IV for the first time, i.e. the operation of ships, trains and aircraft, and oil and gas mining, and development of federal land; and
- regulations pertaining to the remaining general jurisdiction including the public service of Canada.

The revised regulations will clearly define what is required by the provisions in the Code.

12. Summary

The purpose of Part IV is the prevention of work-related injury and illness. Labour Canada administers the *Canada Labour Code*, but both legally and practically, the final responsibility for preventing injury and illness rests with every employer and employee.

B. Responsibilities

1. Overview

Part IV of the *Canada Labour Code* sets out, among other things, the duties and responsibilities of:

a) employers;
b) employees;
c) safety and health committees;
d) safety and health representatives; and
e) Canada Safety Officers.

2. The Employer

The employer must ensure the safety and health of employees while they are at work. More specifically, employers must ensure the following meet the requirements prescribed by the regulations:

a) buildings, structures (permanent or temporary), guards, guardrails, barricades, etc.;

b) protective devices, machinery, tools, vehicles and mobile equipment;
c) boilers, pressure vessels, escalators, elevators, electrical generation equipment, electrical distribution systems;
d) levels of ventilation, lighting and noise;
e) entry into, exit from and occupancy of workplaces and confined spaces; and
f) levels of chemicals, biological and physical agents.

The employer will provide the following according to prescribed standards:

a) first aid, sanitary and personal facilities, and health services;
b) potable water;
c) safety materials, equipment, devices and clothing for every person who has access to the workplace; and
d) information, instruction, training and supervision to ensure the safety and health of employees in the workplace. For example, specifically mentioned in the Code is the requirement to ensure each employee is made aware of every known or foreseeable hazard in the area where the employee works.

The employer will follow prescribed standards to ensure:

a) that concentrations of chemical, biological, and physical agents are controlled;
b) that all hazardous substances are identified and stored or handled safely;
c) compliance with fire safety and emergency measures; and
d) the maintenance of safety and health records.

The employer must investigate, record and report all known accidents, occupational diseases and other hazardous occurrences. The employer is responsible for posting a copy of Part IV of the Code along with a copy of the company safety and health policy.

The employer must adopt and implement prescribed safety codes and standards.

3. The Employee

The employee is generally responsible for taking all reasonable and necessary precautions to ensure his or her own safety and health and that of co-workers or any other

person affected by his or her work. Other specific duties/responsibilities are as follows:

a) The employee shall comply with employer instructions concerning safety and health, with a Canada Safety Officer's directions, and with prescribed procedures concerning safety and health;
b) the employee is obliged to co-operate with persons acting under the authority of Part IV of the Code;
c) the employee shall report any hazard in the workplace to the employer. Specifically mentioned in the Code is the requirement to report all accidents or hazardous occurrences; and
d) the employee shall use safety materials, equipment, devices and/or clothing either furnished by the employer or prescribed by a regulation.

4. The Safety and Health Committee

The safety and health committee may develop, establish and maintain programs, measures and procedures for the improvement of the safety and health of employees while at work. The members of the committee will monitor these activities regularly to ensure effectiveness.

They will receive, consider, and take appropriate action on complaints from employees. They will record these complaints and what action was taken. They will also ensure that proper records are kept for accidents, injuries and hazards in the workplace. All of these activities will be monitored regularly.

The committee shall co-operate with any health service established to serve the workplace. Members shall participate in inquiries and investigations pertaining to safety and health and may consult with professional or technical advisers as required to perform these duties.

They shall have full access to all government and employer reports relating to health and safety of employees except personal medical records of an individual (unless permission is obtained from the individual concerned). In addition to access to reports, they may also request from an employer such information as they consider necessary to identify hazards in the workplace.

5. The Safety and Health Representative

The safety and health representative is selected from among those employees who do not exercise managerial functions. The functions of safety and health representatives are similar to those of a committee, but their powers primarily concern access to information.

6. The Canada Safety Officer

The Canada Safety Officer is a person designated by the minister for the purposes of Part IV of the Code.

The Canada Safety Officer may, in the performance of his or her duties, enter any workplace at any reasonable time. The officer may conduct, or have conducted, tests, examinations, inquiries or inspections. He or she may take samples and remove them for analysis. The officer may take photographs and make sketches of the workplace in conjunction with his or her duties. The officer may request to be accompanied and assisted in these duties.

The officer is empowered to direct the employer:

a) not to disturb a certain area or thing pending the officer's investigation;
b) to produce documents and information relating to the safety and health of the employees; and
c) to make or provide statements respecting working conditions, material and equipment affecting the health and safety of employees in the workplace.

7. Summary

All of the above provisions are extracted from the *Canada Labour Code*, Part IV (Occupational Safety and Health) and are minimum standards. Everyone is encouraged to surpass these standards where feasible in order to minimize safety and health hazards in the Canadian workplace.

C. Occupational Safety and Health Committees/ Representatives

1. Selection Procedures

The employer is required to establish a safety and health committee for any workplace where the staff numbers 20 more. The committee will have at least half of its membership drawn from employees who have no managerial functions. For a workplace where there are five to 19 employees, or for a workplace exempted from the requirement to establish a safety and health committee, there must be a safety and health representative.

The safety and health representative shall be chosen by employees who do not exercise managerial functions or by the trade union or trade unions representing them. The employees are responsible for advising the employer in writing of the name of the person who has been selected. The employer must appoint this person as the safety and health representative. The employees shall all be aware of who represents them, be it on the committee or as a safety and health representative. Posting of the

names of these committee members/representatives and where they work is the responsibility of the employer.

2. Exemptions

An employer is not required to establish a committee for employees based on a ship. This is the only specific exemption to the Code requirements. The minister may also exempt other organizations where it is felt that the nature of the work performed is relatively free from risks to safety and health. Where, because of an exemption, a workplace does not have a committee, the employer shall appoint a safety representative. The safety and health representative shall be chosen as described above.

Organizations that already have a committee established by employer-employee agreement that deals effectively with safety and health in the workplace may also be exempted from the necessity of establishing a new committee as required by the Code. A Canada Safety Officer must authorize this exemption. Once authorized, the committee would perform as outlined in the Code and would have all the rights, powers and functions under the Code in addition to those included in any existing collective agreement.

3. Operation

All members of a safety and health committee or the safety and health representative will be allowed to take the time from work to carry out their safety and health responsibilities. Time spent in performing these duties will be considered as if the member were working on normal tasks, and normal rates of pay will apply. These members cannot be made liable for any act or omission done or omitted to be done in good faith while engaged in safety and health activities.

Meetings of the safety and health committees will be held regularly, once a month as a minimum. Additional meetings required by emergency or urgent situations may be convened at any time.

4. Powers

The following are the powers of safety and health committees and safety and health representatives.

1. A safety and health committee:

    a) shall receive, consider and expeditiously dispose of complaints relating to the safety and health of the employees represented by the committee;

b) shall maintain records pertaining to the disposition of complaints relating to the safety and health of the employees represented by the committee;
c) shall co-operate with any occupational health service established to serve the workplace;
d) may establish and promote safety and health programs for the education of the employees represented by the committee;
e) shall participate in all inquiries and investigations pertaining to occupational safety and health, including such consultations as may be necessary with persons who are professionally or technically qualified to advise the committee on such matters;
f) may develop, establish and maintain programs, measures and procedures for the protection or improvement of the safety and health of employees;
g) shall monitor on a regular basis programs, measures and procedures related to the safety and health of employees;
h) shall ensure that adequate records are kept on work accidents, injuries and health hazards and shall monitor data relating to such accidents, injuries and hazards on a regular basis;
i) shall co-operate with safety officers;
j) may request from an employer such information as the committee considers necessary to identify existing or potential hazards with respect to materials, processes or equipment in the workplace; and
k) shall have full access to all government and employer reports relating to the safety and health of the employees represented by the committee, but shall not have access to the medical records of any person except with the consent of that person.

2. A safety and health representative:

a) shall receive, consider and expeditiously dispose of complaints relating to the safety and health of the employees represented by the representative;
b) shall participate in all inquiries and investigations pertaining to occupational safety and health, including such consultations as may be necessary with persons who are professionally or technically qualified to advise the representative on such matters;
c) shall monitor on a regular basis programs, measures and procedures related to the safety and health of employees;

d) shall ensure that adequate records are kept on work accidents, injuries and health hazards and shall monitor data relating to such accidents, injuries and hazards on a regular basis;
e) may request from an employer such information as the committee considers necessary to identify existing or potential hazards with respect to materials, processes or equipment in the workplace; and
f) shall have full access to all government and employer reports relating to the safety and health of the employees represented by the committee, but shall not have access to the medical records of any person except with the consent of that person.

D. Employee's Right to Refuse Dangerous Work

1. Overview

Under the *Canada Labour Code*, Part IV, employees have the right to refuse dangerous work without risking their jobs or remuneration.

If an employer takes or threatens disciplinary action against an employee exercising the right to refuse, the affected employee may complain to the Canada Labour Relations Board or, in the case of a member of the public service, to the Public Service Staff Relations Board. The appropriate board may order the employer to cease the disciplinary action and to revoke any penalty imposed on the employee as a result of the refusal.

To exercise the right established under the Code, an employee must have reasonable cause to believe that:

a) his or her use or operation of the equipment will result in a danger to that employee or another employee, or
b) a condition in or associated with the workplace could cause a danger to the employee.

There are two general limitations on the right to refuse dangerous work, and certain procedural differences which apply only to crews of ships and aircraft while these are in operation. These limitations and differences are described on pages 140 to 141.

For the purpose of Part IV, 'danger' means 'any hazard or condition that could reasonably be expected to cause injury or illness to a person exposed thereto before the condition or hazard can be corrected.'

The employee must follow the refusal process as laid down in Part IV and summarized below.

2. Refusal Process

Report to Employer

This first step for an employee exercising the right to refuse dangerous work is to report this refusal immediately to his or her employer (supervisor) and to a member of the safety and health committee or the safety and health representative.

Investigation by Employer

The employer must investigate the refusal in the presence of the employee and either an employee member of the safety and health committee or the safety and health representative or, if there is no committee or representative, at least one person selected by the employee.

Continued Refusal

Where the employer decides that there is no danger or takes steps to correct the danger, but the employee has reasonable cause to believe that a danger continues to exist, the employee may continue to refuse. In this case, both the employer and the employee *must* contact a Canada Safety Officer.

Reassignment of Employee and Task

Until the Canada Safety Officer has arrived, investigated, and made a decision, the employer:

- may require the employee to remain in a safe place nearby;
- may assign the employee to reasonable alternate work; and
- may not assign the work in question to another employee unless that other employee has been informed of the refusal.

Investigation and Decision by a Canada Safety Officer

A Canada Safety Officer, in the presence of the employer and the employee (or the employee's representative), investigates the matter, decides whether a danger exists and informs the employer and employee of his or her decision.

Result of Decision

If the Canada Safety Officer decides that a danger does exist, he or she issues a direction to the employer to correct the situation. The employee may continue to refuse the work until the direction is complied with.

If the Canada Safety Officer decides that no danger exists, the employee no longer has the right to refuse under the protection of Part IV, but may appeal this decision to the Canada Labour Relations Board or the Public Service Staff Relations Board as described under 'Appeals'.

Appeals

If the Canada Safety Officer decides that no danger exists, the employee may request that the decision be referred to the Canada Labour Relations Board or the Public Service Staff Relations Board. This request must be made in writing within seven days of receiving notification of the safety officer's decision.

The appropriate board inquires into the circumstances of the decision and may either confirm it or direct the employer to correct the situation.

Limitations

An employee may not refuse to work under Part IV if:

a) the employee's refusal puts the life, health or safety of another person directly in danger, or
b) the perceived danger is inherent in the employee's work or is a normal condition of employment.

3. Exceptions for Crews of Ships and Aircrafts

Report to Person in Charge

Where an employee on a ship or aircraft that is in operation wishes to exercise the right to refuse dangerous work, he or she reports the matter without delay to the person in charge of the craft.

Result of Decision

If the person in charge decides that the refusal would not affect the safe operation of the craft, the employee may discontinue the work.

If, however, the person in charge decides that discontinuing the work would affect the safe operation of the craft, then the employee may not exercise the right to refuse as long as the craft is in operation.

A ship or aircraft remains 'in operation' until it arrives at its first destination in Canada. The employee may then exercise the right to refuse, beginning with 'Report to Employer' as described in the 'Refusal Process'.

4. Summary

An employee has the right to refuse work provided he or she acts in accordance with the provisions of Part IV. However, this right cannot be exercised if doing so directly endangers another person's life, health or safety. An employer is prohibited from disciplining an employee who exercises the right to refuse under Part IV. Should the employer take or threaten disciplinary action, the employee may appeal this action to the Canada Labour Relations Board or, in the case of public service employees, the Public Service Staff Relations Board. The burden of proof in these situations rests with the employer. An employer taking such action against an employee is also liable to prosecution for such an offence.

E. Services Available from Labour Canada

As part of an education and information service to employers and employees, Labour Canada prepares publications that are available through regional and district offices free of charge. The following are available in both English and French.

1. Role of Labour Canada
2. Guide to Regulations
3. Joint Safety and Health Committees
4. Establishment and Operation of Safety and Health Committees
5. The Occupational Safety and Health Information Centre
6. Planning for Safety
7. Accident Investigation and Reporting
8. Safety Audit Guide
9. Technical Inspections — Boilers and Pressure Vessels, Elevating Devices and Manlifts
10. Grain Industry Dust Explosions and Fires
11. Industrial Accident Costs (1969-1979)
12. Employment Injuries and Occupational Illnesses (Statistics)
13. Tips on Prevention of Back Injuries
14. The Code and You — Part IV

In 1986, new publications will be available on the following topics*.

1. Personal Protective Equipment
2. Workplace Inspections*
3. Ergonomics

In addition to the programs and services that are available at regional and district offices, our headquarters office offers an occupational safety and health information service that will help you in determining:

- the methods and procedures for carrying out a job safely;
- whether a substance is dangerous to health or safety; and
- the laws and regulations applying to an individual workplace.

You may contact the Occupational Safety and Health Information Centre by calling (819) 997-0038. There is no charge, and we accept collect calls.

Résumé

La santé et la sécurité au travail dans le cas des employés du gouvernement fédéral et de ses organismes sont régies par la quatrième partie du *Code canadien du travail*. Le guide qui suit a pour objet d'expliquer cette partie et il est reproduit avec l'autorisation de Travail Canada.

Acknowledgement

This article has been reprinted with permission of Labour Canada. The Editorial Board is grateful to A. Pighin and C. Racine for their assistance.

*The publication on Workplace Inspections is available, whereas the other two are still in preparation.

Ontario Ministry of Labour Occupational Health and Safety Division Publications

Summary

Listed herein are some of the publications available from the Ministry of Labour. For further information, please contact the Standards and Programs Branch.

Ontario Ministry of Labour,
Standards and
Programs Branch,
400 University Avenue,
9th Floor,
Toronto, Ontario
M7A 1T7.

Consultants' Studies

Subject	Study
– Acrylonitrile	Occupational Health Implications of Acrylonitrile in Ontario. Michael Holliday & Associates, June 1980.
– Amines and Azo Compounds	An Assessment of the Hazards of Aromatic Amines and Azo Compounds in Ontario. Wellington Environmental Consultants Inc., April 1983.
– Benzene	Occupational Health Implications of Benzene in Ontario. Michael Holliday & Associates, December 1979.
– Cadmium	Cadmium and Its Compounds: Health Impact of Production and Usage in the Work Place. Hatch Associates Ltd., November 1981.
– Chlorinated Hydrocarbons	Occupational Exposure to Certain Chlorinated Hydrocarbons (Trichloroethylene, Tetrachloroethylene, Methyl Chloroform). Concord Scientific Corporation, 1982.
– Chlorine	Occupational Health Implications of Chlorine Use in Ontario. IEC Beak Consultants Ltd., November 1983.
– Chromium	The Occupational Aspects of Hexavalent Chromium in Ontario. M. Sabanski Associates, February 1980.
– Coal Tar Pitch Volatiles	Occupational Health Aspects of Exposure to Coal Tar Pitch Volatiles (CTPV) in Ontario. Michael Holliday & Associates, June 1983.

– Diesel Exhaust Emissions	Occupational Health Aspects of Diesel Exhaust Emissions in Ontario. Michael Holliday & Associates, November 1981.
– Dry Cleaning	A Survey of the Solvent Inhalation Exposure in Ontario's Dry Cleaning and Degreasing Plants. Guelph Chemical Laboratories Ltd., 1981.
– Epoxy Resins	Worker Exposure to Epoxy Resins and Associated Substances. Acres Consulting Services Ltd., December 1984. See also 'Plastics'.
– Ethylene Oxide	Occupational Health Aspects of Ethylene Oxide Use in Ontario. Michael Holliday & Associates, August 1982.
– Formaldehyde	Occupational Health Implications of the Use of Formaldehyde in Ontario. Michael Holliday & Associates, July 1980.
– Isocyanates	Assessment of Worker Exposure to Isocyanates. United Technology and Science Inc., February 1982.
– Lead	See 'Printing Operations'.
– Nickel	Worker Exposure to Nickel and Its Compounds. Acres Consulting Services Ltd., October 1982.
– Plastics	Assessment of Worker Exposure to Styrene and Epoxy Resin in the Reinforced Plastics Industry. University of Western Ontario (Occupational Health and Safety Resource Centre), February 1982.
– Printing Operations	Lead in Printing Operations – An Investigation of Nine Plants in Southwestern Ontario. University of Waterloo (The Centre for Occupational Health and Safety), March 1981.

– Solvents	See 'Dry Cleaning' and 'Chlorinated Hydrocarbons'.
– Styrene	Occupational Health Survey of Worker Exposure to Styrene. Acres Consulting Services Ltd., August 1981. See also 'Plastics'.
– Trimellitic Anhydride	Occupational Exposure to Trimellitic Anhydride in Ontario. M.M. Dillon Limited, October 1983.
– Vinyl Chloride	Industrial Hygiene Surveys of Plants Using or Producing Vinyl Chloride. Ontario Research Foundation, May 1981.
– Welding	Occupational Exposure to Welding and Cutting Hazards in Ontario. Hatch Associates Ltd., January 1985.
– Wood Dust	Wood Dust Exposure in Ontario Industry: The Occupational Health Aspects. Michael Holliday & Associates, March 1986.
– Workplace Labelling	Workplace Labelling of Hazardous Substances. Concord Scientific Corporation, 1980.

Health Effects Documents

Subject	Study
– Acrylonitrile	An Analysis of Health Effects Information for Acrylonitrile and Recommendations for an Occupational Standard. MOL, June 1983. Health Effects Document for Acrylonitrile. Syracuse Research Corporation, June 1983. Carcinogenicity of Acrylonitrile. U.S. Environmental Protection Agency (Cancer Assessment Group), June 1983.

– Arsenic	An Analysis of Health Effects of Arsenic and Its Inorganic Compounds and Recommendations for an Occupational Standard. MOL, August 1983.
– Asbestos	On an Occupational Standard for Exposure to Asbestos. MOL, August 1978.
	A Discussion of Health Effects Issues Relevant to the Setting of an Occupational Standard for Exposure to Asbestos in Ontario. MOL, August 1981.
– Benzene	An Analysis of Health Effects of Benzene and Recommendations for an Occupational Standard. MOL, July 1983.
– Cadmium	Health Effects of Cadmium and Its Inorganic Compounds. MOL, May 1985.
– Chromium	Effects of Chromium Compounds on Human Health. McMaster University (Dept. of Biochemistry and Occupational Health Program), December 1984.
	Summary of the Health Effects of Chromium. MOL, January 1986; revised September 1986.
– Coal Tar	Health Effects of Coal Tar Products and Bitumens. McMaster University, September 1986.
– Ethylene Oxide	Health Effects of Ethylene Oxide. McMaster University, 1983.
	A Risk Assessment for Occupational Exposure to Ethylene Oxide. MOL, October 1983; revised April 1984.
– Formaldehyde	Formaldehyde Toxicity – Proposed TWA Exposure Criterion. MOL, July 1983.

– Isocyanates	Health Effects of Isocyanates with Addenda of June 1981 and October 1982. MOL, November 1978.
– Lead	Lead and Its Inorganic Compounds. MOL, October 1978 (with Addendum of April 1981).
– Mercury	Health Criteria Document – Mercury and Its Compounds. MOL (with Addenda of May 1981).
– Nickel	Health Effects Document on Nickel. Odense University, Denmark (Dept. of Environmental Medicine), 1986.
– Silica	Occupational Exposure to Silica. MOL, March 1979 (with Addendum of September 1982).
– Styrene	Evaluation of Styrene Health Effects and Exposure-Effect Relationship(s). MOL, November 1984. The Effect of Styrene Exposure on the Human Nervous System. MOL, February 1984.
– Tobacco Smoke	The Health Effects of Involuntary Exposure to Tobacco Smoke. MOL, June 1985.
– Vinyl Chloride	Occupational Exposure to Vinyl Chloride. MOL, October 1979 (including Addendum of June 1981).
– Welding	The Health Effects of Welding and Cutting Fumes. MOL, October 1985.
– Wood Dusts	The Health Effects of Exposure to Wood Dusts. MOL, June 1986.

Other Studies	**Subject**	**Study**
	– Asbestos	Report of the Royal Commission on Matters of Health and Safety Arising From the Use of Asbestos in Ontario (3 volumes). J. Stefan Dupre, Chairman, 1984.

(This Report* along with the 'Related Publications', is available from the Ontario Government Bookstore.)

Related Publications of Royal Commission on Asbestos

RCA Study Series

No. 1. Collective Bargaining and Asbestos Dangers at the Workplace. Morley Gunderson and Katherine Swinton, 1981.

No. 2. Workers' Compensation and Asbestos in Ontario. Peter S. Barth, 1982.

No. 3. Policy Options in the Regulation of Asbestos-Related Health Hazards. Carolyn J. Tuohy and Michael J. Trebilcock, 1982.

No. 4. The Politics of Risk: The Identification of Toxic and Other Hazardous Substances in Canada. G. Bruce Doern, 1982.

No. 5. Living with Contradictions: Health and Safety Regulation and Implementation in Ontario. G. Bruce Doern, Michael Prince and Garth McNaughton, 1982.

No. 6. Worker Attitudes About Health and Safety in Three Asbestos Brake Manufacturing Plants. Sally Luce and Gene Swimmer, 1982.

No. 7. The Technical Feasibility and Cost of Controlling Workplace Exposure to Asbestos Fibres. Gordon M. Bragg, 1982.

No. 8. Asbestos in Buildings. Donald J. Pinchin, 1982.

No. 9. Measurement of Asbestos Fibre Concentrations in Workplace Atmospheres. Eric J. Chatfield, 1982.

No. 10. Measurement of Asbestos Fibre Concentrations in Ambient Atmospheres. Eric J. Chatfield, 1983.

*Available on microfiche only.

RCA Background Paper Series

No. 1. A Survey of Asbestos Policies in Canada with Particular Emphasis on Ontario. Sandra Glasbeek, 1981.

No. 2. A Review of Four Major Reports on the Health Hazards of Asbestos. The Canadian Centre for Occupational Health and Safety, 1981.

– Ethylene Oxide	Task Force Report on Survey of Ethylene Oxide Use in Ontario Hospitals, September 1984.
– Formaldehyde	Report of a Panel: Review of the Available Information on the Health Effects of Occupational Exposure to Formaldehyde. E. Farber, L. Goldberg and I.C. Munro, January 1985.
– Gold Miners	Study of Mortality of Ontario Gold Miners, 1955-1977. J. Muller, et al., July 1986.
– Lead	The Health Effect of Lead in Gasoline. Evert Nieboer and Annalee Yassi, April 1983.
– Mining	Towards Safe Production: The Report of The Joint Federal-Provincial Inquiry Commission into Safety in Mines and Mining Plants in Ontario (2 volumes). Kevin M. Burkett, Chairman, April 1981. See also 'Gold Miners' and 'Occupational Health and Safety'.
– Noise	Report of the Special Advisory Committee on the Noise Regulation. Kevin M. Burkett, December 1985.
– Occupational Health and Safety	Report of the Royal Commission on the Health and Safety of Workers in Mines. James M. Ham, Commissioner, 1976.

	– Printing	Dermatitis in the Printing Industry. St. Michael's Hospital (Department of Occupational and Environmental Health), no date.
	– Talc	Report of Committee to Review Certain Questions Concerning the Health Effects of Fibrous Dust Particles in Talc. Scientific Task Force on Talc (ACOHOS), September 1984.
	– Workers' Compensation	Reshaping Workers' Compensation for Ontario. Paul C. Weiler, November 1980. Protecting the Worker From Disability: Challenges for the Eighties. Paul C. Weiler, April 1983. Permanent Partial Disability: Alternative Models For Compensation, December 1986.

Safety Studies

- Attitudes, Communication and Occupational Safety: Overcoming Attitudes Towards Disabled Employees. Gerald Goldberg.
- Female Capacity for Physical Work. John Vander Doelen.
- Fitness and Occupational Injuries: A Review. John Vander Doelen.
- Helping Behaviour within the Workplace: A Guide to Stimulating Safety Advice, Warnings of Potential Dangers, and Speedy Responses to Emergencies. Gerald Goldberg.
- Human Factors – Occupational Safety. D.F. Jones.*
- Intellectual Skills and Personality Traits. Gerald Goldberg.
- An Investigation into the Effect of Concrete Reinforcement Work on Degenerative Back Disease and Back Injury. Franz Schneider.

*Available for reference purposes only at the Ministry of Labour Library.

- Lifting as an Industrial Hazard. John R. Brown.*

- Low Back Pain Syndrome: Its Etiology and Prevention. John R. Brown.*

- Manual Lifting and Related Fields: An Annotated Bibliography. John R. Brown.*

- Occupational Safety Programmes – Are they worth it? (A Subjective Study of Occupational Safety Enforcement and Related Matters in Six Provinces and Six States). Don F. Jones.*

- Repetitive Strain Injuries: A Preventative Approach. Heather MacDonald.

- Shift Work: The Problems and Approaches. John Vander Doelen.

- A Study of Variations in Human Performance (2 volumes). A. Raouf et al.*

- Work Practices to Reduce Heat Strain. John Vander Doelen.

Papers

- Human Factors and Fire Safety Report. Heather MacDonald.

- Manual Materials Handling. G.R. Wright.

- Overview of VDT Ergonomics. G.R. Wright.

Hazard Alerts

- Asbestos on Pipes and Boilers, June 1984.

- Asbestos – Vehicle Repair, June 1984.

- Carbon Monoxide Hazard in Arenas, December 1983.

- Chicots (available in French) October 1984.

- Conveyors, March 1984.

*Available for reference purposes only at the Ministry of Labour Library.

- Elevated or Suspended Work Places on Building Facades, February 1984.
- Enriched Oxygen Atmosphere, August 1983.
- Entry into Septic and Sewage Holding Tanks, October 1985.
- Explosion of Tires During Repair (available in French) March 1985.
- Hang Up Trees (available in French) April 1984.
- Isocyanates – Auto Body Shops, July 1986.
- Lathe Turnings, August 1984.
- Manholes in Sewers (available in French) January 1986.
- Refuse Packer Trucks, January 1986 (revised).
- Road Tanker Explosion (available in French) October 1984.
- Sewer Cleaning Bucket Machines, August 1985.
- Sidewalk Sandspreader Fatality, August 1983.
- Spring Brakes, August 1983.
- Suspended Equipment and Displays, December 1983.
- Toxic Fumes from Welding on Surfaces with Protective Coatings, January 1984.
- Waste Shredder Compactor (available in French) April 1984.

Résumé

Voici une liste de publications que l'on peut obtenir auprès du ministère du Travail. Pour avoir de plus amples renseignements, veuillez communiquer avec la Direction des normes et des programmes.

Book Reviews

Working Paper 53: Workplace Pollution

Published by the Law Reform Commission of Canada, Ottawa, 1987; 89+pp

Copies available, free of charge, from Law Reform Commission of Canada, 130 Albert Street, Ottawa, Ontario K1A 0L6.

As we become increasingly aware of the health hazards posed by the substances used in the workplaces, the protection of worker health becomes a matter of great urgency for workplace parties, legislators and government officials. Coming to grips with this issue is the subject of a report by the Law Reform Commission of Canada entitled '*Workplace Pollution*'. The authors of the report describe its purpose as an evaluation '... of the ways in which the laws which protect Canadians from the effects of this reality (workplace pollution) can and should be improved....'

The report can be divided into two broad categories: a description of the nature and scope of the problem of workplace pollution and a discussion of the methods that can be employed to attack the problem.

The report outlines the severity of the consequences associated with exposure to workplace pollution, including a variety of cancers, reproductive hazards and damage to the brain and central nervous system. The insidious nature of many of these health effects is such that the damage may occur only gradually as a result of prolonged exposure to workplace pollutants. The report describes the difficult policy decisions that face scientists and regulators in assessing and controlling workplace pollution. One such issue is weighing the consequences of a false negative finding (a failure to find sufficient evidence to confirm a hypothesis that is true) with those of a false positive finding (inaccurate confirmation of a hypothesis that is not true). Another, is balancing the risks and benefits of over- and under-regulating. As the report points out, these issues may be of great importance in terms of meeting legal standards of proof for purposes of workers' compensation and other civil liabilities.

With respect to the solution of the problem of workplace pollution, the report comes out strongly in favour of criminal sanctions against those in positions of authority in the event of death or the infliction of serious bodily harm. While bringing to bear the importance of the problem of workplace pollution to upper levels of management is certainly a laudable goal, the report itself

describes the weaknesses inherent in using the criminal law to address problems of occupational health and safety. Among these problems are the difficulty of pinpointing an individual in management who can be held criminally responsible, the resource implications for undertaking an aggressive policy of prosecution and the fact that the health effects of workplace pollution may not manifest themselves for a lengthy period of time.

The report is critical of the internal responsibility system because of the lack of authority accorded to joint health and safety committees to bring about changes in the workplace. While the report makes no specific recommendation about increasing the authority of joint health and safety committees, it does recommend legislation in the area of worker-right-to-know and the strengthening of work refusal provisions. The report also concludes that workers could utilize the collective bargaining process in their quest for greater protection of worker health and safety. As the report points out, however, only 35 per cent of the work force is unionized, and the nature of collective bargaining is such that issues of occupational health and safety may be 'traded off' for concessions in other areas.

Perhaps the most valuable service performed by the Law Reform Commission of Canada in its report on workplace pollution is a challenging consideration of the policy questions that lie behind many of the scientific and legal questions in the field of occupational health and safety. A consideration of these policy issues is essential if we are to advance the cause of occupational health and safety in a logical and coherent manner.

W. D'Arcy Hoobin

The Spills Bill: Duties, Rights and Compensation

S.M. Makuch

Published by Butterworths, Toronto, 1986; 67+pp.

The Spills Bill, Part IX of Ontario's Environmental Protection Act, became law in 1985. Stan Makuch's book examines the legislation and how it has changed the law in relation to spills. This analysis, presented as a series of papers, will interest those working with materials that may be spilled.

The first paper reviews the common law and how it treats spill victims. Civil actions and remedies are discussed, as well as procedural problems and defences. As the author notes, the common law is not without problems for spill victims. It is these problems that resulted in the enactment of the legislation.

The second paper summarizes Part IX and the impact it has had. The paper reviews the duty on owners or per-

sons with control of pollutants to report spills and clean them up. It also discusses the rights of spill victims to obtain compensation and the alternative mechanisms available if those liable for the spill do not pay compensation.

The third paper examines the effect of the legislation on insurance, in terms of both liability and the availability of coverage. The fourth paper considers loss control. Finally, the fifth paper reviews specific problems, including spills from sewer systems and waste disposal sites. The book is extensively appendixed and contains some useful summaries.

It is important for the reader to understand the difference between spills in an occupational context and spills in an environmental context. This book examines only the latter. The reader should be aware that discharges contained *inside* buildings are not spills and that Part IX was *not* intended to replace workers' compensation.

This book will be of some use to managers who will have to take extra precautions as a result of the duties set out in the legislation; however, at $42 it is rather an expensive primer.

G. Rempe

Publications Available From The Government Book Store

Revised Regulations of Ontario, 1980 Regulation 692/80 Industrial Establishments

Revised Regulations of Ontario, 1980 Regulation 691/80 Construction Projects

Inventory of Agents or Combinations of Agents for the Purpose of Section 21 of the Act. Ontario Regulation 693/80

Revised Regulations of Ontario, 1980 Regulation 694/80 Mines and Mining Plants

Regulation respecting Lead – made under the Occupational Health and Safety Act Ontario Regulation 536/81

Regulation respecting Mercury – made under the Occupational Health and Safety Act Ontario Regulation 141/82

Regulation respecting Vinyl Chloride – made under the Occupational Health and Safety Act Ontario Regulation 516/82

Regulation respecting Coke Oven Emissions – made under the Occupational Health and Safety Act Ontario Regulation 517/82

Regulation respecting Asbestos – made under the Occupational Health and Safety Act Ontario Regulation 570/82

Critical Injury Defined Ontario Regulation 714/82

Regulation respecting Fire Fighters Protective Equipment – made under the Occupational Health and Safety Act Ontario Regulation 125/83

Regulation respecting Isocyanates – made under the Occupational Health and Safety Act Ontario Regulation 455/83

Regulation respecting Silica – made under the Occupational Health and Safety Act Ontario Regulation 769/83

X-Ray Safety Code made under the Healing Arts Radiation Protection Act (R.S.O., 1980, Chapter 195 as amended S.O., 1984, Chapter 9) Ontario Regulation 45/84

Regulation to Amend Regulation 691 of Revised Regulations of Ontario, 1980 Ontario Regulation 156/84

Regulation to Amend Regulation 694 of Revised Regulations of Ontario, 1980 Ontario Regulation 190/84

Regulation respecting Teachers – made under the Occupational Health and Safety Act Ontario Regulation 191/84

Regulation respecting University Academics and Teaching Assistants – made under the Occupational Health and Safety Act Ontario Regulation 307/84

Regulation respecting Benzene – made under the Occupational Health and Safety Act Ontario Regulation 732-84

Regulation respecting Acrylonitrile – made under the Occupational Health and Safety Act Ontario Regulation 733/84

Regulation respecting Asbestos on Construction Projects and in Buildings and Repair Operations – made under the Occupational Health and Safety Act Ontario Regulation 654/85

Regulation respecting Arsenic – made under the Occupational Health and Safety Act Ontario Regulation 176/86

Regulation for X-Ray Safety – made under the Occupational Health and Safety Act Ontario Regulation 632/86

Regulation respecting Oil and Gas-Offshore – made under the Occupational Health and Safety Act Ontario Regulation 633/86

Regulation respecting Diving – made under the Occupational Health and Safety Act Ontario Regulation 634/86

Regulation respecting Control of Exposure to Biological or Chemical Agents – made under the Occupational Health and Safety Act Ontario Regulation 654/86

Regulation respecting Ethylene Oxide – made under the Occupational Health and Safety Act Ontario Regulation 146/87

Support Literature

An Occupational Health Nurse's Guide to the Preparation of a Policy and Procedure Manual

A Guide to the Occupational Health and Safety Act

A Guide for Joint Health and Safety Committees and Representatives in the Workplace

Designated Substances in the Workplace: A General Guide to the Regulations

Designated Substances in the Workplace: A Guide to the Lead Regulation

Designated Substances in the Workplace: A Guide to the Benzene Regulation

Designated Substances in the Workplace: A Guide to the Silica Regulation

Designated Substances in the Workplace: A Guide to the Mercury Regulation

News and Notes

Tenth Intensive Workshop in Industrial Hygiene

The Tenth Intensive Workshop in Industrial Hygiene, to be held at the University of Toronto, is designed for professional occupational hygienists who, perhaps as a result of specialization, feel the need for a general refresher course, for recent entrants to the hygiene field who wish to broaden their background knowledge and for management, safety professionals and labour representatives who wish to acquire a rapid understanding of industrial hygiene.

The workshop is organized by the Department of Chemical Engineering and Applied Chemistry and will be held Monday, September 28 through Friday, October 2, 1987. The panel of lecturers includes Dr. John Steel, Dip.Occ.Hyg., of Newcastle-upon Tyne, United Kingdom, personnel from the Ontario Ministry of Labour, and Faculty and Staff of the University of Toronto. The expertise of the speakers covers all relevant aspects of hygiene, risk assessment, human factors engineering, toxicology, occupational medicine and occupational health and safety legislation. A hands-on equipment demonstration is included in the workshop. The problem of coping with Ontario's designated substances will be specifically addressed.

The Industrial Hygiene and Hazard Control Engineering Program of the University of Toronto is presenting the workshop in association with the Occupational and Environmental Health Unit, Faculty of Medicine, University of Toronto and the Industrial Accident Prevention Association of Ontario. Professor J.W. Smith, Ph.D., C.Eng., C.I.H., Chairman of the Department of Chemical Engineering and Applied Chemistry, is Program Director.

Enquiries should be addressed to:

Department of Chemical Engineering
and Applied Chemistry,
University of Toronto,
Toronto, Ontario
M5S 1A4
(416) 978-3066

1987 Professional Conference on Industrial Hygiene, sponsored by the American Academy of Industrial Hygiene. September 15 to 18, 1987. San Diego, CA.

The theme of the 1987 PCIH will be a critical review of the 1970 *Occupational Safety and Health Act*. Sessions will analyse the Act and its impact on the profession of industrial hygiene. Discussions will include a better understanding of the Act and possible strategies for living with and improving the Act.

NOT FOR CIH's ONLY!

Fees: $110.00 – Pre-registration; $120.00 – On-site Registration.

For more information contact: PCIH, 475 Wolf Ledges Parkway, Akron, OH 44311-1087, Telephone (216) 762-7294.

Coming Events

August 8–13, 1987	International Congress of Epidemiology, HELSINKI, FINLAND. Contact: IEA-Congress Secretariat, P0B 189, SF-00171 Helsinki, Finland; 358-0-602163.
August 16–19, 1987	Canadian Society of Safety Engineering, 18th Annual Professional Development Conference, VICTORIA, B.C., CANADA. For further information, contact: John A. Fletcher and Associates Ltd., 1087 Meyerside Dr., Suite 5, Mississauga, Ontario. L5T 1M5.
September 2–4, 1987	International Conference on Detection Methods for DNA-Damaging Agents in Man: Applications in Cancer Epidemiology and Prevention. ESPO, HELSINKI, FINLAND. For further information, contact: K. Hemminki, Institute of Occupational Health. Topeliuksenkatu 41aA, Helsinki, Finland, 00250.
September 15–17, 1987	Inter-Noise 87, BEIJING, CHINA. Contact: Inter-Noise 87 Secretariat, 5 Zhongguancun Street, P.O. Box 2712, Beijing, China.
September 15–18, 1987	6th International Heavy Metals in the Environment Conference. NEW ORLEANS, U.S.A. For further information, contact: David Cowan, Technical Media Services, 62 Kelvingrove St., Glasgow, Scotland, U.K., G3 7SA.
September 17–19, 1987	European Society of Toxicology, 28th Congress. STRASBOURG, FRANCE. Contact: The Secretariat Eurotox '87, Prof. G. Dirheimer, Institut de Biologie Moléculaire et Cellulaire du C.N.R.S., 15, rue Descartes, Strasbourg, France, F-67084, Cedex.
September 27– October 2, 1987	XXII International Congress on Occupational Health. SYDNEY, AUSTRALIA. For further information, contact: The Secretariat, XXII International Congress on Occupational Health., G.P.O. Box 2609, Sydney, N.S.W., Australia, 2001.

October 6–8, 1987	1st International Symposium on Bio-Processing Safety Standard Guidelines and Practices to Insure Worker Safety in the Bio-Processing of Industrial Chemicals, Foods and Waste Products. WASHINGTON, D.C., U.S.A. For further information, contact: W.C. Hyer, Jr., Princeton, N.J., U.S.A., 08543-2003. Phone (609) 896-2437.
October 10–12, 1987	Technical Seminar on Chemical Spills. TORONTO, CANADA. For further information, contact: M. Cloutier, Technology Development and Technical Services Branch, Environment Canada, Ottawa, Ontario, Canada. K1A 1C8.
October 14–16, 1987	9th International Colloquium on the Prevention of Occupational Risks due to Electricity. MADRID, SPAIN. For further information, contact: Berufsgenossenschaft der Feinmechanik und Elektrotechnik, Gustav-Heinemann-Uffer 130, D-500 Cologne 51, West Germany.
October 14–17, 1987	20th Annual Meeting of the Human Factors Association of Canada, MONTREAL, CANADA. For further information, contact: Denis Giguère, 505 Blvd de Maisonneuve West, Montréal, Québec, H3A 3C2.
March 8–10, 1988	First International Conference on the Global Impact of AIDS, LONDON, ENGLAND. Contact: Emap Maclaren Exhibitions Ltd., P.O. Box 138, Token House, 79-81 High Street, Croydon, England, CR9 3SS.
April 10–17, 1988	Seventh International Congress of the International Radiation Protection Association, SYDNEY, AUSTRALIA. For further information, contact: IRPA Secretariat, GPO Box 2609, Sydney, NSW, Australia, 2001.
August 15–18, 1988	ICCEF 88. Third International Conference on the Combined Effects of Environmental Factors, FINLAND. Contact: Chairman, Doc DR Olavi Manninen, ICCEF 88, Secretariat, c/o Dept. of Public Health, Medical Faculty, University of Tampere, P.O. Box 607, Tampere, Finland, SF-33101.
September 5–8, 1988	CIB Conference – Healthy Buildings '88. STOCKHOLM, SWEDEN. For further information, contact: The Swedish Council for Research, S:t Goransgatan 66, Stockholm, Sweden, S-112 33.
September 19–22, 1988	Second International Symposium on Ventilation for Contaminant Control, Ventilation 88, LONDON, ENGLAND. Contact: P.J. Hewitt (Ventilation 88), University of Bradford, West Yorkshire, England, BD7 1DP.

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